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[6450-01-P]

DEPARTMENT OF ENERGY

10 CFR Part 431

[Docket No. EERE-2014-BT-STD-0015]

RIN 1904-AB23

Energy Conservation Program for Certain Industrial Equipment: Energy Conservation Standards for Commercial Heating, Air-Conditioning, and Water-Heating Equipment

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy.

ACTION: Notice of data availability and request for public comment.

SUMMARY: The Energy Policy and Conservation Act of 1975 (EPCA), as amended, directs the U.S. Department of Energy (DOE) to establish energy conservation standards for certain commercial and industrial equipment, including commercial heating, air-conditioning, and water-heating equipment. Of particular relevance here, the statute also requires that each time the corresponding consensus standard − the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE)/ Illuminating Engineering Society (IES) Standard 90.1 − is amended by the industry, DOE must assess whether there is a need to update the uniform national energy conservation standards for the same equipment covered under EPCA. ASHRAE officially released an amended version of this industry standard (ASHRAE Standard 90.1-2013), on October 9, 2013, thereby triggering DOE's related obligations under EPCA. As a first step in

meeting this statutory requirement, today's notice of data availability (NODA) discusses the results of DOE's analysis of the energy savings potential of amended energy conservation standards for certain types of commercial equipment covered by ASHRAE Standard 90.1. The energy savings potentials are based upon either the efficiency levels specified in the amended industry standard (i.e., ASHRAE Standard 90.1-2013) or more-stringent levels that would result in significant additional conservation of energy and are technologically feasible and economically justified. DOE is publishing this NODA to: announce the results and preliminary conclusions of DOE's analysis of potential energy savings associated with amended standards for this equipment, and request public comment on this analysis, as well as the submission of data and other relevant information.

DATES: DOE will accept written comments, data, and information regarding this NODA no later than **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**.

ADDRESSES: Any comments submitted must identify the NODA for ASHRAE Equipment and provide the docket number EERE-2014-BT-STD-0015 and/or Regulatory Information Number (RIN) 1904-AB23. Interested parties are encouraged to submit comments electronically. However, comments may be submitted by any of the following methods:

- Federal eRulemaking Portal: www.regulations.gov. Follow the instructions for submitting comments.
- E-mail: ComHeatingACWHEquip2014STD0015@ee.doe.gov. Include docket number EERE-2014-BT-STD-0015 and/or RIN number 1904-AB23 in the subject line of the

message. All comments should clearly identify the name, address, and, if appropriate, organization of the commenter. Submit electronic comments in WordPerfect, Microsoft Word, PDF, or ASCII file format, and avoid the use of special characters or any form of encryption.

- Postal Mail: Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Office, Mailstop EE-5B, 1000 Independence Avenue, SW., Washington, DC 20585-0121. If possible, please submit all items on a compact disc (CD), in which case it is not necessary to include printed copies. (Please note that comments sent by mail are often delayed and may be damaged by mail screening processes.)
- Hand Delivery/Courier: Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Office, Sixth Floor, 950 L'Enfant Plaza, SW., Washington, DC 20024. Telephone: (202) 586-2945. If possible, please submit all items on a CD, in which case it is not necessary to include printed copies.

No telefacsimilies (faxes) will be accepted. For detailed instructions on submitting comments and additional information on the rulemaking process, see section IV of this document (Public Participation).

Docket: The docket is available for review at http://www.regulations.gov, including Federal Register notices, comments, and other supporting documents/materials throughout the rulemaking process. All documents in the docket are listed in the www.regulations.gov index. However, not all documents listed in the index may be publicly available, such as information that is exempt from public disclosure.

A link to the docket webpage can be found at: http://www.regulations.gov/#!docketDetail;D=EERE-2014-BT-STD-0015. This webpage contains a link to the docket for this notice on the www.regulations.gov site. The www.regulations.gov webpage contains simple instructions on how to access all documents, including public comments, in the docket. See section IV, "Public Participation," for information on how to submit comments through www.regulations.gov.

For information on how to submit a comment or review other public comments and the docket, contact Ms. Brenda Edwards at (202) 586-2945 or by e-mail: Brenda.Edwards@ee.doe.gov.

FOR FURTHER INFORMATION CONTACT: Ms. Ashley Armstrong, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Office, EE-5B, 1000 Independence Avenue, SW., Washington, DC 20585-0121. Telephone: (202)586-6590. E-mail: Ashley.Armstrong@ee.doe.gov.

Mr. Eric Stas, U.S. Department of Energy, Office of the General Counsel, GC-71, 1000 Independence Avenue, SW., Washington, DC 20585-0121. Telephone: (202) 586-9507. E-mail: Eric.Stas@hq.doe.gov.

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I. Introduction

A. Authority

Title III, Part C[1] of the Energy Policy and Conservation Act of 1975 (EPCA or the Act), Pub. L. 94-163 (42 U.S.C. 6311-6317, as codified), added by Pub. L. 95-619, Title IV, § 441(a), established the Energy Conservation Program for Certain Industrial Equipment, which includes the commercial heating, air-conditioning, and water-heating equipment that is the subject of this rulemaking.[2] In general, this program addresses the energy efficiency of certain types of commercial and industrial equipment. Relevant provisions of the Act specifically include definitions (42 U.S.C. 6311), test procedures (42 U.S.C. 6314), labelling provisions (42 U.S.C. 6315), energy conservation standards (42 U.S.C. 6313), and the authority to require information and reports from manufacturers (42 U.S.C. 6316).

In relevant part here, EPCA contains mandatory energy conservation standards for commercial heating, air-conditioning, and water-heating equipment. (42 U.S.C. 6313(a)) Specifically, the statute sets standards for small, large, and very large commercial package air-conditioning and heating equipment, packaged terminal air conditioners (PTACs) and packaged terminal heat pumps (PTHPs), warm-air furnaces, packaged boilers, storage water heaters, instantaneous water heaters, and unfired hot water storage tanks. Id. In doing so, EPCA established Federal energy conservation standards that generally correspond to the levels in the American Society of Heating,

[1] For editorial reasons, upon codification in the U.S. Code, Part C was redesignated Part A-1.
[2] All references to EPCA in this document refer to the statute as amended through the American Energy Manufacturing Technical Corrections Act (AEMTCA), Pub. L. 112-210 (Dec. 18, 2012).

Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings, as in effect on October 24, 1992 (i.e., ASHRAE Standard 90.1-1989), for each type of covered equipment listed in 42 U.S.C. 6313(a). The Energy Independence and Security Act of 2007 (EISA 2007) further amended EPCA by adding definitions and setting minimum standards for single-package vertical air conditioners (SPVACs) and single-package vertical heat pumps (SPVHPs), which are collectively referred to as single-package vertical units (SPVUs). (42 U.S.C. 6313(a)(10)(A)) The standards for SPVACs and SPVHPs established by EISA 2007 corresponded to the levels contained in ASHRAE Standard 90.1-2004, which originated as addendum "d" to Standard 90.1-2001.

In acknowledgement of technological changes that yield energy efficiency benefits, Congress directed DOE through EPCA to consider amending the existing Federal energy efficiency standard for each type of equipment listed, each time ASHRAE Standard 90.1 is amended with respect to such equipment. (42 U.S.C. 6313(a)(6)(A))

For each type of equipment, EPCA directs that, if ASHRAE Standard 90.1 is amended,[3] DOE must adopt amended standards at the new efficiency level in ASHRAE Standard 90.1, unless clear and convincing evidence supports a determination that adoption of a more-stringent level as a national standard would produce significant additional energy savings and be technologically feasible and economically justified. (42 U.S.C. 6313(a)(6)(A)(ii)) If DOE decides to adopt as a national standard the minimum efficiency levels specified in the amended ASHRAE Standard 90.1, DOE must establish such standard not later than 18 months after publication of the amended industry standard. (42 U.S.C. 6313(a)(6)(A)(ii)(I)) However, if DOE determines that a more-stringent standard is justified under 42 U.S.C. 6313(a)(6)(A)(ii)(II), then DOE must establish such more-stringent standard not later than 30 months after publication of the amended ASHRAE Standard 90.1. (42 U.S.C. 6313(a)(6)(B))

As a preliminary step in the process of reviewing the changes to ASHRAE Standard 90.1, EPCA directs DOE to publish in the Federal Register for public comment

[3] Although EPCA does not explicitly define the term "amended" in the context of ASHRAE Standard 90.1, DOE provided its interpretation of what would constitute an "amended standard" in a final rule published in the Federal Register on March 7, 2007 (hereafter referred to as the "March 2007 final rule"). 72 FR 10038. In that rule, DOE stated that the statutory trigger requiring DOE to adopt uniform national standards based on ASHRAE action is for ASHRAE to change a standard for any of the equipment listed in EPCA section 342(a)(6)(A)(i) (42 U.S.C. 6313 (a)(6)(A)(i)) by increasing the energy efficiency level for that equipment type. Id. at 10042. In other words, if the revised ASHRAE Standard 90.1 leaves the standard level unchanged or lowers the standard, as compared to the level specified by the national standard adopted pursuant to EPCA, DOE does not have the authority to conduct a rulemaking to consider a higher standard for that equipment pursuant to 42 U.S.C. 6313(a)(6)(A). DOE subsequently reiterated this position in a final rule published in the Federal Register on July 22, 2009. 74 FR 36312, 36313.

However, in the AEMTCA amendments to EPCA in 2012, Congress modified several provisions related to ASHRAE Standard 90.1 equipment. In relevant part, DOE is now triggered to act whenever ASHRAE Standard 90.1's "standard levels or design requirements under that standard" are amended. (42 U.S.C. 6313(a)(6)(A)(i)) Furthermore, DOE is now required to conduct an evaluation of each class of covered equipment in ASHRAE Standard 90.1 "every 6 years." (42 U.S.C. 6313(a)(6)(C)(i)) For any covered equipment for which more than 6 years has elapsed since issuance of the most recent final rule establishing or amending a standard for such equipment, DOE must publish either the required notice of determination that standards do not need to be amended or a NOPR with proposed standards by December 31, 2013. DOE has incorporated these new statutory mandates into its rulemaking process for covered ASHRAE 90.1 equipment.

an analysis of the energy savings potential of amended energy efficiency standards within 180 days after ASHRAE Standard 90.1 is amended with respect to any of the covered products specified under 42 U.S.C. 6313(a). (42 U.S.C. 6313(a)(6)(A))

On October 9, 2013, ASHRAE officially released for distribution and made public ASHRAE Standard 90.1-2013.[4] This action by ASHRAE triggered DOE's obligations under 42 U.S.C. 6313(a)(6), as outlined previously. This notice of data availability (NODA) presents the analysis of the energy savings potential of amended energy efficiency standards, as required under 42 U.S.C. 6313(a)(6)(A)(i).

B. Purpose of the Notice of Data Availability

As explained previously, DOE is publishing today's NODA as a preliminary step pursuant to EPCA's requirements for DOE to consider amended energy conservation standards for certain types of commercial equipment covered by ASHRAE Standard 90.1, whenever ASHRAE amends its standard to increase the energy efficiency level for that equipment type. Specifically, this NODA presents for public comment DOE's analysis of the potential energy savings for amended national energy conservation standards for these types of commercial equipment based on: (1) the amended efficiency levels contained within ASHRAE Standard 90.1-2013, and (2) more-stringent efficiency levels. DOE describes these analyses and preliminary conclusions and seeks input from interested parties, including the submission of data and other relevant information.

[4] This industry standard is developed with input from a number of organizations – most prominently ASHRAE, the American National Standards Institute (ANSI), and the Illuminating Engineering Society (IES). Therefore, this document may sometimes be referred to more formally as ANSI/ASHRAE/IES Standard 90.1-2013. See www.ashrae.org for more information.

DOE is not required by EPCA to review additional changes in ASHRAE Standard 90.1-2013 for those equipment types where ASHRAE did not increase the efficiency level or change the design requirements compared to the existing Federal energy conservation standards. For those types of equipment for which efficiency levels or design requirements clearly did not change, DOE has conducted no further analysis. Therefore, DOE carefully examined the changes for such equipment in ASHRAE Standard 90.1 in order to thoroughly evaluate the amendments in ASHRAE 90.1-2013, thereby permitting DOE to determine what action, if any, is required under its statutory mandate.

Section II of this notice contains a discussion of DOE's evaluation of each ASHRAE equipment type for which energy conservation standards have been set pursuant to EPCA ("covered equipment"), in order for DOE to determine whether the amendments in ASHRAE Standard 90.1-2013 have resulted in increased efficiency levels or changes in design requirements. For covered equipment types determined to have increased efficiency levels or changes in design requirements in ASHRAE Standard 90.1-2013, DOE subjected that equipment to further analysis as discussed in section III of this NODA.

In summary, the energy savings analysis presented in this NODA is a preliminary step required under 42 U.S.C. 6313(a)(6)(A)(i). After review of the public comments on this NODA, if DOE determines that the amended efficiency levels in ASHRAE Standard 90.1-2013 have the potential for additional energy savings for types of equipment currently covered by uniform national standards, DOE will commence a rulemaking to consider amended standards, based upon either the efficiency levels in ASHRAE Standard 90.1-2013 or more-stringent efficiency levels that would be expected to result in significant additional conservation of energy and are technologically feasible and economically justified. In conducting such rulemaking, DOE will address the general rulemaking requirements for all energy conservation standards, such as the anti-backsliding provision[5] (42 U.S.C. 6316(a); 42 U.S.C. 6295(o)(1); 42 U.S.C. 6313(a)(6)(B)(iii)(I)), the criteria for making a determination that a standard is economically justified[6] (42 U.S.C. 6316(a); 42 U.S.C. 6295(o)(2)(B)(i)-(ii); 42 U.S.C. 6313(a)(6)(B)(ii)), and the prohibition on making unavailable existing products with performance characteristics generally available in the United States.[7] (42 U.S.C. 6316(a); 42 U.S.C. 6295(o)(4); 42 U.S.C. 6313(a)(6)(B)(iii)(II)).

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[5] EPCA contains what is commonly known as an "anti-backsliding" provision. (42 U.S.C. 6316(a); 42 U.S.C. 6295(o)(1)) This provision mandates that the Secretary not prescribe any amended standard that either increases the maximum allowable energy use or decreases the minimum required energy efficiency of covered equipment. The AEMTCA amendments to EPCA added this requirement to Part A-1 directly at 42 U.S.C. 6313(a)(6)(B)(iii)(I).

[6] In deciding whether a more stringent standard is economically justified, DOE must review comments on the proposed standard, and then determine whether the benefits of the standard exceed its burdens by considering the following seven factors to the greatest extent practicable:

(1) The economic impact on manufacturers and consumers subject to the standard;
(2) The savings in operating costs throughout the estimated average life of the product in the type (or class), compared to any increase in the price, initial charges, or maintenance expenses of the products likely to result from the standard;
(3) The total projected amount of energy savings likely to result directly from the standard;
(4) Any lessening of product utility or performance likely to result from the standard;
(5) The impact of any lessening of competition, as determined in writing by the Attorney General, likely to result from the standard;
(6) The need for national energy conservation; and
(7) Other factors the Secretary considers relevant.

(42 U.S.C. 6316(a); 42 U.S.C. 6295(o)(2)(B)(i)-(ii)) The AEMTCA amendments to EPCA added this requirement to Part A-1 directly at 42 U.S.C. 6313(a)(6)(B)(ii).

[7] The Secretary may not prescribe an amended standard if interested persons have established by a preponderance of evidence that the amended standard would likely result in unavailability in the U.S. of any covered product type or class of performance characteristics, such as reliability, features, capacities, sizes, and volumes that are substantially similar to those generally available in the U.S. at the time of the Secretary's finding. (42 U.S.C. 6316(a); 42 U.S.C. 6295(o)(4)) The AEMTCA amendments to EPCA added this requirement to Part A-1 directly at 42 U.S.C. 6313(a)(6)(B)(iii)(II).

C. Background

1. ASHRAE Standard 90.1-2013

As noted previously, ASHRAE released a new version of ASHRAE Standard 90.1 on October 9, 2013. The ASHRAE standard addresses efficiency levels for many types of commercial heating, ventilating, air-conditioning (HVAC), and water-heating equipment covered by EPCA. ASHRAE Standard 90.1–2013 revised the efficiency levels for certain commercial equipment, but for the remaining equipment, ASHRAE left in place the preexisting levels (i.e. the efficiency levels specified in EPCA or the efficiency levels in ASHRAE Standard 90.1-2010). ASHRAE Standard 90.1-2013 did not change any of the design requirements for the commercial (HVAC) and water-heating equipment covered by EPCA.

Table I.1 shows the equipment classes (and corresponding efficiency levels) for which efficiency levels in ASHRAE Standard 90.1-2013 (for metrics included in Federal energy conservation standards) differed from the previous version of ASHRAE Standard 90.1 (i.e., ASHRAE Standard 90.1-2010). Table I.1 also displays the existing Federal energy conservation standards for those equipment classes. Section II of this document assesses each of these equipment types to determine whether the amendments in ASHRAE Standard 90.1-2013 constitute increased energy efficiency levels, which would necessitate further analysis of the potential energy savings from amended Federal energy conservation standards; the conclusions of this assessment are presented in the final column of Table I.1.

Table I.1 Federal Energy Conservation Standards and Energy Efficiency Levels in ASHRAE Standard 90.1-2013 for Specific Types of Commercial Equipment*

ASHRAE Equipment Class**	Energy Efficiency Levels in ASHRAE Standard 90.1-2010	Energy Efficiency Levels in ASHRAE Standard 90.1-2013	Federal Energy Conservation Standards	Energy-Savings Potential Analysis Required?
Commercial Package Air-Conditioning and Heating Equipment – Air-Cooled				
Air-Cooled Air Conditioner, 3-Phase, Single-Package, <65,000 Btu/h	13.0 SEER	14.0 SEER (as of 1/1/2015)	13.0 SEER	Yes See section II.A.1
Air-Cooled Heat Pump, 3-Phase, Single-Package, <65,000 Btu/h	13.0 SEER 7.7 HSPF	14.0 SEER 8.0 HSPF (as of 1/1/2015)	13.0 SEER 7.7 HSPF	Yes See section II.A.1
Air-Cooled Heat Pump, 3-Phase, Split System, <65,000 Btu/h	13.0 SEER 7.7 HSPF	14.0 SEER 8.2 HSPF (as of 1/1/2015)	13.0 SEER 7.7 HSPF	Yes See section II.A.1
Commercial Package Air-Conditioning and Heating Equipment – Water Source				
Water-Source Heat Pump, <17,000 Btu/h	11.2 EER 4.2 COP	12.2 EER 4.3 COP_H***	11.2 EER 4.2 COP	Yes See section II.A.2
Water-Source Heat Pump, ≥17,000 and <65,000 Btu/h	12.0 EER 4.2 COP	13.0 EER 4.3 COP_H***	12.0 EER 4.2 COP	Yes See section II.A.2
Water-Source Heat Pump, ≥65,000 and <135,000 Btu/h	12.0 EER 4.2 COP	13.0 EER 4.3 COP_H***	12.0 EER 4.2 COP	Yes See section II.A.2
Commercial Package Air- Conditioning and Heating Equipment – PTACs‡‡				
Package Terminal Air Conditioner, <7,000 Btu/h, Standard Size (New Construction) †	EER = 11.7 (as of 10/8/12)	EER = 11.9 (as of 1/1/2015)	EER = 11.7	Yes See section II.A.3
Package Terminal Air Conditioner, ≥7,000 and ≤15,000 Btu/h, Standard Size (New Construction) †	EER = 13.8 – (0.300 x Cap††) (as of 10/8/12)	EER = 14.0 – (0.300 x Cap††) (as of 1/1/2015)	EER = 13.8 – (0.300 x Cap††)	Yes See section II.A.3
Package Terminal Air Conditioner, >15,000 Btu/h, Standard Size (New Construction) †	EER = 9.3 (as of 10/8/12)	EER = 9.5 (as of 1/1/2015)	EER = 9.3	Yes See section II.A.3
Commercial Package Air-Conditioning and Heating Equipment – SDHV and TTW				
Through-the-Wall (TTW), Air-Cooled Heat Pumps, ≤30,000 Btu/h	13.0 SEER 7.4 HSPF	12.0 SEER 7.4 HSPF	13.0 SEER 7.7 HSPF	No See section II.A.4
Small-Duct, High-Velocity, Air-Cooled (SDHV) Air Conditioners, <65,000 Btu/h	10.0 SEER	11.0 SEER	13.0 SEER	No See section II.A.4

Small-Duct, High-Velocity, Air-Cooled Heat Pumps, <65,000 Btu/h	10.0 SEER HSPF not listed†††	11.0 SEER 6.8 HSPF	13.0 SEER 7.7 HSPF	No See section II.A.4
Commercial Package Air-Conditioning and Heating Equipment – SPVACs and SPVHPs				
Single Package Vertical Air Conditioners, <65,000 Btu/h	9.0 EER	10.0 EER	9.0 EER	Yes See section II.A.5
Single Package Vertical Air Conditioners, ≥65,000 and <135,000 Btu/h	8.9 EER	10.0 EER	8.9 EER	Yes See section II.A.5
Single Package Vertical Air Conditioners, ≥135,000 and <240,000 Btu/h	8.6 EER	10.0 EER	8.6 EER	Yes See section II.A.5
Single Package Vertical Heat Pumps, <65,000 Btu/h	9.0 EER 3.0 COP	10.0 EER 3.0 COP_H***	9.0 EER 3.0 COP	Yes See section II.A.5
Single Package Vertical Heat Pumps, ≥65,000 and <135,000 Btu/h	8.9 EER 3.0 COP	10.0 EER 3.0 COP_H***	8.9 EER 3.0 COP	Yes See section II.A.5
Single Package Vertical Heat Pumps, ≥135,000 and <240,000 Btu/h	8.6 EER 2.9 COP	10.0 EER 3.0 COP_H***	8.6 EER 2.9 COP	Yes See section II.A.5
Single Package Vertical Air Conditioners Nonweatherized Space Constrained, ≤30,000 Btu/h	N/A	9.2 EER	N/A‡	No See section II.A.5
Single Package Vertical Air Conditioners Nonweatherized Space Constrained, >30,000 and ≤36,000 Btu/h	N/A	9.0 EER	N/A‡	No See section II.A.5
Single Package Vertical Heat Pumps Nonweatherized Space Constrained, ≤30,000 Btu/h	N/A	9.2 EER 3.0 COP_H	N/A‡	No See section II.A.5
Single Package Vertical Heat Pumps Nonweatherized Space Constrained, >30,000 and ≤36,000 Btu/h	N/A	9.0 EER 3.0 COP_H	N/A‡	No See section II.A.5

Commercial Water Heaters				
Electric Storage Water Heaters, >12 kW, ≥20 gal	$20 + 35\,V^{\frac{1}{2}}$ SL[‡‡], Btu/h	$0.3 + 27/V_m$[‡‡‡] %/h	$0.3 + 27/V_m$[‡‡‡] %/h	No See Section II.B
Gas Storage Water Heaters, >75,000 Btu/h, <4,000 Btu/h/gal	80% E_t; $Q/800 + 110\,V^{\frac{1}{2}}$ SL[◊], Btu/h	80% E_t; $Q/799 + 16.6\,V^{\frac{1}{2}}$ SL[◊], Btu/h[◊◊]	80% E_t; $Q/800 + 110\,V_r^{\frac{1}{2}}$ Btu/hr	No See section II.A.5
Oil Storage Water Heaters, >105,000 Btu/h, <4,000 Btu/h/gal	78% E_t; $Q/800 + 110\,V^{\frac{1}{2}}$ SL[◊], Btu/h	80% E_t; $Q/799 + 16.6\,V^{\frac{1}{2}}$ SL[◊], Btu/h[◊◊]	78% E_t; $Q/800 + 110\,V_r^{\frac{1}{2}}$ Btu/hr	Yes See section II.A.5
Gas Instantaneous Water Heaters, ≥200,000 Btu/h, ≥4,000 Btu/h/gal, ≥10 gal	80% E_t, $Q/800 + 110\,V^{\frac{1}{2}}$ SL[◊], Btu/h	80% E_t, $Q/799 + 16.6\,V^{\frac{1}{2}}$ SL[◊], Btu/h[◊◊]	80% E_t, $Q/800 + 110\,V_r^{\frac{1}{2}}$ Btu/hr	No See section II.A.5
Oil Instantaneous Water Heaters, >210,000 Btu/h, ≥4,000 Btu/h/gal, ≥10 gal	78% E_t, $Q/800 + 110\,V^{\frac{1}{2}}$ SL[◊], Btu/h	78% E_t, $Q/799 + 16.6\,V^{\frac{1}{2}}$ SL[◊], Btu/h[◊◊]	78% E_t, $Q/800 + 110\,V_r^{\frac{1}{2}}$ Btu/hr	No See section II.A.5

* “E_t” means thermal efficiency; “EER” means energy efficiency ratio; “SEER” means seasonal energy efficiency ratio; “HSPF” means heating seasonal performance factor; “COP” and “COP_H” mean coefficient of performance; and “Btu/h” or “Btu/hr” means British thermal units per hour.
** ASHRAE Standard 90.1-2013 equipment classes may differ from the equipment classes defined in DOE’s regulations, but no loss of coverage will occur (i.e., all previously covered DOE equipment classes remained covered equipment).
*** While ASHRAE Standard 90.1-2013 added a subscript $_H$ to COP for all heat pumps, its definition for “coefficient of performance (COP), heat pump – heating” has not changed. As a result, DOE believes the subscript to be a clarifying change of nomenclature (to differentiate from the COP metric used for refrigeration) only, rather than a change to the metric itself.
[†]“Standard size” refers to PTAC equipment with wall sleeve dimensions ≥16 inches high or ≥42 inches wide. For DOE’s purposes, this equipment class applies to standard-size equipment regardless of application (*e.g.*, new construction or replacement).
[††] “Cap” means cooling capacity in kBtu/h at 95ºF outdoor dry-bulb temperature.
[†††] This may have been an editorial error in ASHRAE 90.1-2010.
[‡] While ASHRAE Standard 90.1-2013 added this equipment class, DOE believes that equipment falling into these classes is already covered by Federal standards, most commonly in the residential space-constrained central air conditioning equipment class with minimum standards of 12.0 SEER for air conditioners and heat pumps and 7.4 HSPF for heat pumps. See section II.A.5.1 of this NODA.
[‡‡] “V” means rated volume in gallons; “SL” means standby loss.
[‡‡‡] “V_m” means measured volume in tank.
[◊] “Q” means the nameplate input rate in Btu/hr; “V” means rated volume in gallons; “SL” means standby loss. DOE’s descriptor, “Vr,” also means rated volume in gallons and differs only in nomenclature.
[◊◊] As explained in section II.A of this NODA, DOE believes this level was a mistake; the formula for SI units was included instead of that for IP units.

DOE notes that ASHRAE 90.1-2013 also increased integrated energy efficiency ratio (IEER) levels for additional equipment not listed in Table I.1, including small, large, and very large air-cooled and water-cooled air conditioners and heat pumps.[8] However, because Federal energy conservation standards for this equipment do not use IEER as a rating metric, DOE is not triggered to review this equipment. In February 2013, DOE published a request for information (RFI) and notice of document availability for commercial air-cooled equipment. 78 FR 7296 (Feb. 1, 2013). In the RFI, DOE sought information on the merits of adopting IEER as the energy efficiency descriptor for small, large, and very large air-cooled commercial air conditioners and heat pumps. Should DOE adopt new standards using IEER as the metric, future increases in IEER levels in ASHRAE Standard 90.1-2013 as compared to the Federal energy conservation standards would trigger DOE to review its efficiency levels for that equipment?

D. Summary of DOE's Preliminary Assessment of Equipment for Energy Savings Analysis

DOE has reached a preliminary conclusion for each of the classes of commercial equipment in ASHRAE Standard 90.1-2013 addressed in today's NODA. For each class of commercial equipment addressed in this NODA, section II presents DOE's initial determination as to whether ASHRAE increased the efficiency level for a given type of equipment (based on a rating metric used in the relevant Federal energy conservation standards), a change that would require an energy-savings potential analysis. As DOE is not required by EPCA to review additional changes in ASHRAE Standard 90.1-2013 for those equipment types where ASHRAE did not increase the efficiency level or change the design requirements, DOE has conducted no further analysis for those types of equipment where efficiency levels clearly did not change. Additionally, for equipment where ASHRAE Standard 90.1-2013 has increased the level in

[8] ASHRAE 90.1-2013 also decreased the IEER levels for small, large, and very large air-cooled variable refrigerant flow equipment; however, on December 9, 2013, ASHRAE issued errata indicating that this was an error for air conditioners. See: https://www.ashrae.org/File%20Library/docLib/StdsErrata/90-1-2013-IP_ErrataSheet_12-9-2013.pdf. DOE believes this was also an editorial error for heat pumps.

comparison to the previous version of ASHRAE Standard 90.1, but the level does not exceed the current Federal standard level, DOE does not have the authority to conduct a rulemaking to consider a higher standard for that equipment pursuant to 42 U.S.C. 6313(a)(6)(A) and did not perform a potential energy-savings analysis. For those equipment classes where ASHRAE increased the efficiency level (in comparison to the Federal standard), DOE performed an analysis of the energy-savings potential, unless DOE found no equipment in the market in that equipment class (in which case there is no potential for energy savings).[9]

Based upon DOE's analysis, as discussed in section II, DOE has determined that ASHRAE increased the efficiency level for the following equipment categories:

- Small Three-Phase Commercial Air-Cooled Air Conditioners (Single Package Only) and Heat Pumps (Single Package and Split System) <65,000 Btu/h;
- Water Source Heat Pumps;
- Packaged Terminal Air Conditioners (Standard Size);
- Single Package Vertical Air Conditioners and Heat Pumps; and
- Oil-Fired Storage Water Heaters.

For most of those equipment classes, DOE found that equipment is available on the market and adequate information exists to reasonably estimate potential energy savings, and DOE performed an analysis of the energy-savings potential, which is described in section III. However, when DOE did not find equipment available on the market (such as for SPVACs and

[9] In the case where there is no equipment on the market or insufficient data for analysis, DOE would adopt the ASHRAE level, as required by the statute, without further analysis.

SPVHPs with capacities above 135,000 Btu/h), DOE did not perform a potential energy savings analysis.

II. Discussion of Changes in ASHRAE Standard 90.1-2013

Before beginning an analysis of the potential energy savings that would result from adopting the efficiency levels specified by ASHRAE Standard 90.1-2013 or more-stringent efficiency levels, DOE first determined whether or not the ASHRAE Standard 90.1-2013 efficiency levels actually represented an increase in efficiency above the current Federal standard levels or whether ASHRAE Standard 90.1-2013 adopted new design requirements, thereby triggering DOE action. This section contains a discussion of each equipment class where the ASHRAE Standard 90.1-2013 efficiency level differs from the ASHRAE Standard 90.1-2010 level (based on a rating metric used in the relevant Federal energy conservation standards),[10] along with DOE's preliminary conclusion regarding the appropriate action to take with respect to that equipment. In addition, this section contains a discussion of DOE's determination with regard to newly created equipment classes in ASHRAE Standard 90.1-2013 (i.e., nonweatherized, space-constrained SPVAC and SPVHP). Finally, this section provides a brief discussion of the test procedure updates contained in ASHRAE Standard 90.1-2013.

A. Commercial Package Air-Conditioning and Heating Equipment

EPCA, as amended, defines "commercial package air conditioning and heating equipment" as air-cooled, evaporatively-cooled, water-cooled, or water source (not including ground water source) electrically operated, unitary central air conditioners and central air

[10] ASHRAE Standard 90.1-2013 did not change any of the design requirements for the commercial (HVAC) and water-heating equipment covered by EPCA, so this potential category of change is not discussed in this section.

conditioning heat pumps for commercial use. (42 U.S.C. 6311(8)(A); 10 CFR 431.92) EPCA also defines "small," "large," and "very large" commercial package air conditioning and heating equipment based on the equipment's rated cooling capacity. (42 U.S.C. 6311(8)(B)-(D); 10 CFR 431.92) "Small commercial package air conditioning and heating equipment" means equipment rated below 135,000 Btu per hour (cooling capacity). (42 U.S.C. 6311(8)(B); 10 CFR 431.92) "Large commercial package air conditioning and heating equipment" means equipment rated (i) at or above 135,000 Btu per hour; and (ii) below 240,000 Btu per hour (cooling capacity). (42 U.S.C. 6311(8)(C); 10 CFR 431.92) "Very large commercial package air conditioning and heating equipment" means equipment rated (i) at or above 240,000 Btu per hour; and (ii) below 760,000 Btu per hour (cooling capacity). (42 U.S.C. 6311(8)(D); 10 CFR 431.92)

1. Air-Cooled Equipment

The current Federal energy conservation standards for the three classes of air-cooled commercial package air conditioners and heat pumps for which ASHRAE Standard 90.1-2013 amended efficiency levels are shown in Table I.1 and can be found in DOE's regulations at 10 CFR 431.97. The Federal energy conservation standards for air-cooled air conditioners and heat pumps are differentiated based on the cooling capacity (i.e., small, large, or very large). For small equipment, there is an additional disaggregation into: (1) equipment less than 65,000 Btu/h and (2) equipment greater than or equal to 65,000 Btu/h and less than 135,000 Btu/h. Three-phase equipment less than 65,000 Btu/h, although commercial equipment, is rated with the same metric as residential single-phase equipment (i.e., SEER). Unlike the current Federal energy conservation standards, ASHRAE Standard 90.1 also differentiates the equipment that is less than 65,000 Btu/h into split system and single package subcategories. Historically, ASHRAE has set equivalent efficiency levels for this equipment; however, effective January 1, 2015, ASHRAE Standard 90.1-2013 increases the efficiency level for single package air conditioners but not split system air conditioners. The increased efficiency level for single package air conditioners surpasses the current Federal energy conservation standard level for the overall equipment class, while the efficiency level for split system air conditioners meets and does not exceed the Federal energy conservation standard for the overall equipment class. ASHRAE Standard 90.1-2013 also increases the efficiency levels, effective January 1, 2015, for both single package and split system air-cooled heat pumps, for SEER and HSPF, to efficiency levels that surpass the current Federal energy conservation standard levels. ASHRAE Standard 90.1-2013 increases the HSPF level for split systems above that for single package heat pumps.

In the past, DOE has separated the equipment classes for three-phase air conditioners and heat pumps less than 65,000 Btu/h into single package and split system classes, for a total of four classes. However, when EISA 2007 increased the efficiency levels to identical levels across single package and split system equipment, effective in 2008, DOE combined the equipment classes in the Code of Federal Regulations (CFR), resulting in only two equipment classes, one for air conditioners and one for heat pumps. Because ASHRAE has increased the standard for only single package air conditioners, and has increased the HSPF level to a more-stringent level for split system heat pumps than for single package heat pumps, and DOE is obligated to adopt, at a minimum, the increased level in ASHRAE 90.1-2013 for that equipment class, DOE proposes to re-create separate equipment classes for single package and split system equipment in the overall equipment classes of small commercial package air conditioners and heat pumps (air-cooled, three-phase) less than 65,000 Btu/h. DOE requests comment on whether it should re-create these separate equipment classes, which is identified as Issue 1 in section IV.B, "Issues on Which DOE Seeks Comment."

DOE conducted an analysis of the potential energy savings due to amended standards for single package air conditioners and single package and split system heat pumps (air-cooled, three-phase, less than 65,000 Btu/h), which is described in section III of this NODA. DOE did not conduct an analysis of the potential energy savings for split system air conditioners.

2. Water-Source Equipment

The current Federal energy conservation standards for the three classes of commercial water source heat pumps for which ASHRAE Standard 90.1-2013 amended efficiency levels are shown in Table I.1 and can be found in DOE's regulations at 10 CFR 431.97. The Federal energy conservation standards for water source equipment are differentiated based on the cooling capacity. ASHRAE Standard 90.1-2013 increased the energy efficiency levels for all three equipment classes to efficiency levels that surpass the current Federal energy conservation standard levels. Therefore, DOE conducted an analysis of the potential energy savings due to amended standards for this equipment, which is described in section III of this NODA.

ASHRAE Standard 90.1-2013 also changed the name of this equipment class from "water source" to "water to air, water loop." DOE believes this to be an editorial change only and that this new nomenclature refers to the same water source heat pump equipment covered by Federal energy conservation standards. ASHRAE also changed the descriptor for this equipment from COP to COP_H. DOE believes this is also an editorial change to clarify the difference between COP for refrigeration and COP for heat pumps. DOE requests comment on whether these changes are other than editorial, which is identified as Issue 2 in section IV.B, "Issues on Which DOE Seeks Comment."

EPCA does not define "water source heat pump" other than to exclude ground-water-source units from the definition of "commercial package air conditioning and heating equipment." (42 U.S.C. 6311(8)(A)) However, DOE notes that there are several related types of water-source and ground-water-source heat pumps, as shown in Table II.1. ASHRAE Standard 90.1-2013 included new nomenclature for all such types of heat pumps. DOE further notes that the vast majority of water-source (water-to-air, water-loop) heat pump models are also rated for performance in ground-loop or ground-water heat pump applications. It is DOE's understanding that design differences of the models used in the different applications are minimal, including potentially more corrosion-resistant metal in the water coil (for open-loop systems only) and/or added insulation for ground-water or ground-loop systems. Efficiency ratings are different across these three application types primarily because of the different test conditions (ground and ground-water-source are tested with cooler entering water). Because of the similarity in models across application, DOE believes that increased efficiency standards for water-loop applications may affect heat pumps for ground-source and ground-water applications, although they are excluded from coverage. DOE is not aware of any differences between water-source heat pumps for residential and commercial applications.

Table II.1 Nomenclature for Types of Water-Loop, Ground-Loop, and Ground-Water-Source Heat Pumps

ASHRAE Standard 90.1-2010	ASHRAE Standard 90.1-2013	Test Procedure
Water-source (86° entering water)	Water-to-air, water-loop	ISO Standard 13256-1
Ground-water-source 59° entering water	Water-to-air, ground-water	
Ground-water source 77° entering water	Brine-to-air, ground-loop	
Water-source water-to-water 86° entering water	Water-to-water, water-loop	ISO Standard 13256-2
Water-source water-to-water 59° entering water	Water-to-water, ground-water	
Ground-water-source brine-to-water 77° entering water	Brine-to-water, ground-loop	

As noted above, DOE views these changes in nomenclature as nonsubstantive in terms of the associated standard levels. Consequently, DOE is maintaining its current requirements for these equipment classes.

However, DOE is considering adding a definition for "water-source heat pump" to the CFR that would include both single-phase and three-phase units of all capacities (up to 760,000 Btu/h) and would be applicable to water-to-air heat pumps. DOE is considering adapting the definition from that in the ASHRAE handbook [11]: "A water-source heat pump is a [single-phase or three-phase] reverse-cycle heat pump that uses [a circulating water loop] as the heat source for heating and as the heat sink for cooling. The main components are a compressor, refrigerant-to-water heat exchanger, refrigerant-to-air heat exchanger, refrigerant expansion devices, and refrigerant reversing valve." DOE requests comment on this definition, which is identified as Issue 3 in section IV.B, "Issues on Which DOE Seeks Comment."

[11] 2012 ASHRAE Handbook, Heating, Ventilating, and Air-Conditioning Systems and Equipment. ASHRAE, Atlanta, GA. Chapter 9 (Available at: https://www.ashrae.org/resources--publications/description-of-the-2012-ashrae-handbook-hvac-systems-and-equipment).

3. Packaged Terminal Air Conditioners

EPCA defines a "packaged terminal air conditioner" as "a wall sleeve and a separate unencased combination of heating and cooling assemblies specified by the builder and intended for mounting through the wall. It includes a prime source of refrigeration, separable outdoor louvers, forced ventilation, and heating availability by builder's choice of hot water, steam, or electricity." (42 U.S.C. 6311(10)(A); 10 CFR 431.92)

In February 2013, DOE published a notice of public meeting and availability of the Framework Document regarding energy conservation standards for packaged terminal air conditioners and heat pumps standards. 78 FR 12252 (Feb. 22, 2013). This framework was published as a first step toward meeting the six-year look back requirement specified in EISA 2007. (42 U.S.C. 6313(a)(6)(C)(i)) As part of the six-year look back, DOE expects to issue a notice of proposed rulemaking (NOPR) for PTAC and PTHP equipment that will include equipment classes for which ASHRAE Standard 90.1-2013 increased efficiency levels (i.e., standard-size PTACs), as well as those for which it did not. The PTACs/PTHPs NOPR will be issued along a timeline that meets the six-year look back requirements (for those equipment classes where DOE was not triggered), as well as either the 18 or 30 month timeline noted previously (for those equipment classes where DOE was triggered).

The current Federal energy conservation standards for the three classes of PTACs for which ASHRAE Standard 90.1-2013 amended efficiency levels are shown in Table I.1 and are found in DOE's regulations at 10 CFR 431.97. The Federal energy conservation standards for

PTACs are differentiated based on the cooling capacity and physical dimensions (standard versus nonstandard size). ASHRAE Standard 90.1-2013 increased the energy efficiency levels for all three standard-size PTAC equipment classes to efficiency levels that meet those for PTHPs and surpass the current Federal energy conservation standard levels for PTACs. Therefore, DOE conducted an analysis of the potential energy savings due to amended standards for standard-size PTACs, which is described in section III of this NODA.

4. Small-Duct, High-Velocity, and Through-The-Wall Equipment

EPCA does not separate small-duct high-velocity (SDHV) or through-the-wall (TTW) heat pumps from other types of small commercial package air-conditioning and heating equipment in its definitions. (42 U.S.C. 6311(8)) Therefore, EPCA's definition of "small commercial package air conditioning and heating equipment" would include SDHV and TTW heat pumps.

ASHRAE Standard 90.1-2013 appeared to change some of the efficiency levels for these classes of equipment. Specifically, ASHRAE Standard 90.1-2010 had increased the cooling efficiency requirements for TTW heat pumps to 13.0 SEER in comparison to the efficiency levels of 12.0 SEER in ASHRAE Standard 90.1-2007. However, in March 2011, ASHRAE issued Proposed Addendum h for public review that would correct the minimum SEER for this equipment to 12.0 SEER, and this addendum was approved and incorporated into ASHRAE Standard 90.1-2013. Therefore, this change in ASHRAE Standard 90.1-2013 was correcting an editorial error in ASHRAE Standard 90.1-2010.

For SDHV air conditioners and heat pumps, ASHRAE Standard 90.1-2013 increases the cooling efficiency requirement from 10.0 SEER to 11.0 SEER. It also includes a heating efficiency requirement for SDHV heat pumps of 6.8 HSPF, which was present in ASHRAE 90.1-2007 but not ASHRAE 90.1-2010 (which DOE also thought to be an editorial error). These changes were made through Addendum bj to ASHRAE 90.1-2010, which noted that the previously adopted Addendum j to ASHRAE Standard 90.1-2010 had deleted the SDHV equipment class entirely because all SDHV models sold were single-phase residential products, but that Addendum bj was re-establishing the equipment class because manufacturers had expressed an intention to introduce three-phase equipment to the market. In addition, Addendum bj noted that it contained minimum efficiency levels identical to those established by DOE for single-phase residential SDHV products.

The DOE standards for both commercial TTW and SDHV air conditioners, which are 13.0 SEER, and for heat pumps, which are 13.0 SEER and 7.7 HSPF, were established for the overall equipment category of small commercial package air-conditioning and heating equipment by EISA 2007, which amended EPCA. (42 U.S.C. 6313(a)(7)(D)) Because the ASHRAE Standard 90.1-2013 efficiency levels for TTW and SDHV equipment are less than those in the DOE standards, DOE has tentatively concluded that it is not required to take action on this equipment at this time.

5. <u>Single-Package Vertical Air Conditioners and Single-Package Vertical Heat Pumps</u>

EPCA, as amended, defines "single package vertical air conditioner" as air-cooled commercial package air conditioning and heating equipment that:

(1) is factory-assembled as a single package that:

(i) has major components that are arranged vertically;

(ii) is an encased combination of cooling and optional heating components; and

(iii) is intended for exterior mounting on, adjacent interior to, or through an outside wall;

(2) is powered by a single- or 3-phase current;

(3) may contain one or more separate indoor grilles, outdoor louvers, various ventilation options, indoor free air discharges, ductwork, wall plenum, or sleeves; and

(4) has heating components that may include electrical resistance, steam, hot water, or gas, but may not include reverse cycle refrigeration as a heating means. (42 U.S.C. 6311(22)[12]; 10 CFR 431.92)

EPCA, as amended, defines "single package vertical heat pump" as a single-package vertical air conditioner that

(1) uses reverse cycle refrigeration as its primary heat source; and

(2) may include secondary supplemental heating by means of electrical resistance, steam, hot water, or gas. (42 U.S.C. 6311(23); 10 CFR 431.92)

The current Federal energy conservation standards for the six classes of SPVUs for which ASHRAE Standard 90.1-2013 amended efficiency levels are shown in Table I.1 and can be

[12] In the EISA 2007 amendments to EPCA, Congress renumbered several statutory definitions to accommodate new definitions. Consequently, the definition for "harvest rate" was moved from 42 U.S.C. 6311(21) to 42 U.S.C. 6311(22). However, in a separate provision, EISA 2007 provided for a definition of "single package vertical air conditioner" at 42 U.S.C. 6311(22). Similarly, EISA 2007 added a definition for "single package vertical heat pump" at 42 U.S.C. 6311(23), which given the other definitions present, probably should have been codified at 42 U.S.C. 6311(24). DOE has implemented these statutory provisions as if the drafting error had not occurred.

found in DOE's regulations at 10 CFR 431.97. The product classes for SPVACs and SPVHPs, as well as their attendant Federal energy conservation standards, are differentiated based on cooling capacity. ASHRAE Standard 90.1-2013 increased the energy efficiency levels for all six equipment classes to efficiency levels that surpass the current Federal energy conservation standard levels. Therefore, DOE conducted an analysis of the potential energy savings due to amended standards for this equipment, which is described in section III of this NODA.

DOE reviewed the SPVU market and identified several models of SPVUs in the 65,000 Btu/h or less equipment class. However, DOE did not identify any models of SPVUs in the large category ≥135,000 Btu/h and <240,000 Btu/h or any models of SPVHPs in the category ≥65,000 Btu/h and <135,000 Btu/h. As a result of the apparent lack of a market for large SPVUs and for SPVHPs ≥65,000 Btu/h and <135,000 Btu/h, DOE conducted complete preliminary energy saving estimates only for the equipment classes SPVAC and SPVHP <65,000 Btu/h and SPVACs ≥65,000 Btu/h and <135,000 Btu/h. For the equipment classes with no market, DOE would adopt the ASHRAE levels as the Federal standard, as required by the statute, without further analysis.

6. <u>Consideration of a Space-Constrained Single-Package Vertical Unit Equipment Class</u>

ASHRAE Standard 90.1-2013 created a new equipment class for SPVACs and SPVHPs used in space-constrained applications. Specifically, ASHRAE defined "nonweatherized space constrained single-package vertical unit" as a SPVAC or SPVHP that meets all of the following requirements:

(1) is for indoor use only;

(2) has rated cooling capacities no greater than 36,000 Btu/h;

(3) is a single-package unit requiring opening in an exterior wall with overall exterior dimensions that require or use an existing sleeve that meets one of the following criteria:

1. width of less than 32 inches and a height of less than 45 inches
2. fits inside an existing 1,310 in^2 opening;

(4) is commonly installed in site-built commercial buildings;

(5) is of a similar cooling capacity and, if a heat pump, similar heating capacity;

(6) draws outdoor air for heat exchange directly through an existing opening, used for both inlet and outlet, in the exterior wall;

(7) is restricted to applications where an existing air conditioner, heat pump, or gas/electric unit, installed in an existing exterior wall opening, is to be replaced; and

(8) bears a permanent "Replacement" marking, conspicuously placed and clearly indicating that its application is limited to installations where an existing air conditioner or heat pump is to be replaced.

DOE has carefully considered the possibility of establishing an equipment class for space-constrained SPVUs. After reviewing the SPVU market, DOE identified two distinct market segments: (1) traditional SPVUs, which are typically wall hung or installed indoors and intended for use in schools, telecommunications shelters, office buildings, and similar applications; and (2) through-the-wall units that are being classified as SPVUs and are designed to be installed through-the-wall in hotels, apartments, dormitories, assisted living facilities, and other similar applications (*i.e.*, "lodging" applications). Many of the units that are intended primarily for use in lodging applications would meet the definition of a space-constrained SPVU in ASHRAE Standard 90.1-2013, while conversely, none of the models that were intended primarily to serve traditional SPVU applications meet the criteria.

In examining the models that would meet the definition of a "space constrained SPVU" under ASHRAE Standard 90.1-2013, DOE discovered that certain models that are currently classified by manufacturers and in the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Directory[13] as being an SPVU do not have major components arranged vertically, which is a key provision in the SPVAC and SPVHP definitions provided by EPCA (and discussed earlier in this section). For the purposes of determining the applicability of DOE energy conservation standards, the product classification is based on the applicable product and equipment definitions in EPCA and DOE's regulations. DOE does not consider models without the major components arranged vertically to be SPVUs. Depending on the product characteristics (*e.g.*, electrical power phase, capacity), these models should be classified, tested, and certified to DOE as compliant with the applicable standards for either central air conditioners or one of the other equipment types provided by DOE regulations. Accordingly, DOE did not consider these models in its analyses of SPVUs and did not evaluate them when making a determination regarding whether to establish a space-constrained equipment class within the SPVU equipment type.

Furthermore, while reviewing the market to consider a potential space-constrained SPVU equipment class, DOE also discovered that many models characterized by industry as SPVUs, particularly those that are primarily used for lodging applications (which were also the models

[13] AHRI Directory of Certified Product Performance can be accessed at: http://www.ahridirectory.org/ahridirectory/pages/home.aspx.

that met the ASHRAE definition for "space-constrained"), are advertised for use in multiple applications including both commercial and residential applications. Many of the models characterized as SPVUs on the market are advertised to a significant extent for use in residential, multi-family applications; however, DOE notes that these products are currently classified and certified in the AHRI Directory as single-package vertical units, a type of commercial equipment. Further, DOE found that certain models of SPVUs in the AHRI Directory that would be categorized as "space-constrained" were previously classified as through-the-wall central air conditioners.[14]

Upon discovering the dual-market applications of these units, DOE considered whether the classification of these products as SPVUs – a type of commercial equipment – is appropriate. SPVUs are classified as a type of commercial air conditioner under 42 U.S.C. chapter 77, subchapter III, Part A-1, "Certain Industrial Equipment." EPCA defines industrial equipment as any article of equipment of certain specified types that consumes, or is designed to consume, energy, which is distributed to any significant extent for industrial and commercial use, and which is not a covered product as defined in 42 U.S.C. 6291(2), without regard to whether

[14] DOE defined a product class for space-constrained central air conditioners, a consumer product type, in a January 22, 2001 final rule, which DOE stated would include through-the-wall products among several other types of space-constrained products. However, DOE did not set minimum standards for the space-constrained product class. 66 FR 7170, 7197. In a May 23, 2002 final rule, DOE established a separate product class with minimum standards for through-the-wall products. 67 FR 36368, 36406. Upon establishing that product class, DOE also provided in its definition of "through-the-wall air conditioner" that the class would cease to exist on January 23, 2010. Id. In a June 27, 2011 direct final rule, DOE stated that products in the through-the-wall product class of central air conditioners would meet the definition of a "space constrained central air conditioner." 76 FR 37408, 37446. The American Energy Manufacturing Technical Corrections Act (AEMTCA), Pub. L. 112-210 (enacted Dec. 18, 2012), prescribed definitions for "through-the-wall central air conditioner" and "through-the-wall central air conditioning heat pump." 42 U.S.C. 6295(d)(4)(A)(ii). In a proposed rule published on December 20, 2013 78FR77019, DOE proposed to eliminate the previous definition for through-the-wall products and adopted these statutory definitions. DOE noted that such products must be assigned to a product class based on the product's characteristics and suggested that most would be assigned to one of the space-constrained product classes.

such article is in fact distributed in commerce for industrial or commercial use. (42 U.S.C. 6311(2)(A))

EPCA defines "consumer product" as any article of a type that consumes or is designed to consume energy, and, to any significant extent, is distributed in commerce for personal use or consumption by individuals without regard to whether such article of such type is in fact distributed in commerce for personal use or consumption by an individual. (42 U.S.C. 6291(1))

Thus, consumer products and industrial equipment are mutually exclusive categories. An appliance model can only be considered commercial/industrial equipment under EPCA if it does not fit the definition of "consumer product." Further, DOE must make a determination as to whether a model is a consumer product or commercial equipment, "without regard" to how the model is "in fact" distributed. DOE notes that many of the products that are currently classified by industry as a commercial SPVU and advertised for multi-family residential applications would meet EPCA's definitions for "SPVUs" from a technical standpoint. (42 U.S.C. 6311(22) and (23)) However, DOE reviewed the characteristics of these products and concluded that they would also meet the definition of a "central air conditioner." (42 U.S.C. 6291(21)) EPCA defines "central air conditioner" as a product, other than a packaged terminal air conditioner, which: (1) is powered by single phase electric current; (2) is air-cooled; (3) is rated below 65,000 Btu per hour; (4) is not contained within the same cabinet as a furnace with a rated capacity above 225,000 Btu per hour; and (5) is a heat pump or a cooling only unit. (42 U.S.C. 6291(21); 10 CFR 430.2) DOE has concluded that, because these products meet the definition of a "central air conditioner," are similar to products used in residential applications, and are seemingly (based on product literature and advertising of known products and manufacturers) distributed for personal use or consumption by individuals, they are appropriately categorized as consumer products under the statute.[15] Because such units meet the definition for a "consumer product" under 42 U.S.C. 6291(1), they cannot meet the definition of commercial "industrial equipment" under 42 U.S.C. 6311(2). In fact, as noted above, certain products that are currently categorized by manufacturers as commercial SPVUs were at one time categorized as through-the-wall central air conditioners by their manufacturers but have since been reclassified as commercial equipment.

Through-the-wall models for commercial lodging applications that are not specifically advertised for the residential multi-family market (and that were not previously categorized as through-the-wall residential units) are appropriately classified as consumer products because they are for personal use or consumption by individuals. DOE examined the types of models that are currently characterized as SPVUs and are intended to serve the lodging market but have not been reclassified from the through-the-wall central air conditioner product class. It noted similarities in the design, construction, and applications for these products as compared to the products that were classified previously as through-the-wall central air conditioners. Given the similarities between through-the-wall units intended for installation in multi-family residential applications and those intended primarily for installation in commercial lodging applications, DOE has tentatively concluded that these products should be treated the same under its regulatory scheme.

[15] An air conditioner that cools a single apartment and is controlled by the residents of that apartment is for personal use, just like an air conditioner found in a single-family home, duplex, condo, or townhouse.

In examining the through-the-wall models on the market that are not advertised for residential applications or were not reclassified, DOE has determined that the available models would all meet the definition of a "central air conditioner" and, more specifically, a "space constrained product." 10 CFR 430.2. In the proceedings that led to the development of the space-constrained central air conditioner product class, DOE recognized that through-the-wall products have severe space constraints and, accordingly, established a product class with less-stringent energy conservation standards for such units.[16] 67 FR 36368, 36406 (May 23, 2002). Because the space-constrained central air conditioner product class has already been established to account for products whose outer dimensions are severely limited by their application and, given the similarities and overlap between models used in commercial lodging applications and models used in residential multi-family applications, DOE believes that any single-package vertical units that are "space-constrained" are appropriately categorized and regulated as central air conditioners.

As a result, DOE has determined that, based on the available product literature, as well as the governing definitions in EPCA, certain units currently listed by manufacturers as SPVUs are being misclassified and are appropriately classified as central air conditioners (and in most cases as space-constrained central air conditioners). The majority of these products are models that would meet the "space constrained" definition in ASHRAE Standard 90.1-2013. Because DOE has established a space-constrained product class to account for space-constrained through-the-wall units and because these units meet the existing definitions, DOE has tentatively concluded

[16] Through-the-wall air conditioners are typically not as wide or deep as standard air conditioning units and, in the case of units intended for replacement, must fit into a pre-existing hole in the wall. This size limitation affects the size of both the evaporator and condensing heat exchangers. Additionally, the airflow through the unit is restricted by this size limitation, which reduces the heat exchanger's effectiveness.

that there is no need to establish a separate space-constrained class for SPVUs. Therefore, DOE has not analyzed separate standards for space-constrained SPVU equipment in this NODA. DOE requests comment on this conclusion, which is identified as Issue 4 in section IV.B, "Issues on Which DOE Seeks Comment." In making this determination, DOE was also mindful of the purposes underlying EPCA and the Department's energy and water conservation standards regulations: to conserve energy and water supplies and to increase energy and cost savings for American businesses and consumers. Allowing a model of a product type that is sold for personal use to evade DOE's energy conservation standards for consumer products, simply because it is sold in some instances to commercial or industrial users, would undermine this purpose.

B. Commercial Water Heaters

EPCA defines "storage water heater" as a water heater that heats and stores water within the appliance at a thermostatically controlled temperature for delivery on demand and that is industrial equipment. This term does not include units with an input rating of 4,000 Btu/h or more per gallon of stored water. (42 U.S.C. 6311(12)(A); 10 CFR 431.102) EPCA defines "instantaneous water heater" as a water heater that has an input rating of at least 4,000 Btu/h per gallon of stored water and that is industrial equipment, including products meeting this description that are designed to heat water to temperatures of 180ºF or higher. (42 U.S.C. 6311(12)(B); 10 CFR 431.102)

The current Federal energy conservation standards for the five classes of storage and instantaneous water heaters for which ASHRAE Standard 90.1-2013 amended efficiency levels are shown in Table I.1 and set forth in DOE's regulations at 10 CFR 431.110. The product classes for commercial storage and instantaneous water heaters, and attendant Federal energy conservation standards, are differentiated based on fuel type. ASHRAE Standard 90.1-2013 appeared to change the standby loss levels for four equipment classes (gas-fired storage water heaters, oil-fired storage water heaters, gas-fired instantaneous water heaters, and oil-fired instantaneous water heaters) to efficiency levels that surpass the current Federal energy conservation standard levels. However, upon review of the changes, DOE believes that all changes to standby loss levels for these equipment classes were editorial errors because they are identical to SI (International System of Units; metric system) formulas rather than I-P (Inch-Pound; English system) formulas. Therefore, DOE did not conduct an analysis of the potential energy savings for this equipment. ASHRAE Standard 90.1-2013 also changed the standby loss level for electric storage water heaters, in this case in a purposeful manner to align with the current Federal energy conservation standard level. Because these levels meet and do not exceed the current Federal standards, DOE did not conduct an analysis of the potential energy savings for this equipment class. ASHRAE Standard 90.1-2013 also increased the thermal efficiency levels for oil-fired storage water heaters to efficiency levels that surpass the current Federal energy conservation standards. Therefore, DOE conducted an analysis of the potential energy savings due to amended thermal efficiency standards for oil-fired storage water heaters, which is described in section III of this NODA.

C. Test Procedures

EPCA requires the Secretary to amend the test procedures for ASHRAE equipment to the latest version generally accepted by industry or the rating procedures developed or recognized by AHRI or by ASHRAE, as referenced by ASHRAE/IES Standard 90.1, unless the Secretary determines by clear and convincing evidence that the latest version of the industry test procedure does not meet the requirements for test procedures described in paragraphs (2) and (3) of 42 U.S.C. 6314(a).[17] (42 U.S.C. 6314(a)(4)(B)) ASHRAE Standard 90.1-2013 updated several of its test procedures for ASHRAE equipment. Specifically, ASHRAE Standard 90.1-2013 updated to the most recent editions of test procedures for small commercial package air conditioners and heating equipment (AHRI 210/240-2008[18] with Addendum 1 and 2, Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment), large and very large commercial package air conditioners and heating equipment (AHRI 340/360-2007 with Addenda 1 and 2, Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment), variable refrigerant flow equipment (AHRI 1230-2010 with Addendum 1, Performance Rating of Variable Refrigerant Flow (VRF) Multi-Split Air-Conditioning and Heat Pump Equipment), commercial warm-air furnaces (ANSI (American National Standards Institute) Z21.47-2012, Standard for Gas-Fired Central Furnaces), and commercial water heaters (ANSI Z21.10.3-2011, Gas Water Heaters, Volume III, Storage Water Heaters with Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous).

DOE has preliminarily reviewed each of the test procedures that were updated in ASHRAE Standard 90.1-2013 and discusses the changes to the test procedures below.

[17] Specifically, the relevant provisions (42 U.S.C. 6314(a)(2)-(3)) provide that test procedures must be reasonably designed to produce test results that reflect energy efficiency, energy use, and estimated operating costs of a type (or class) of industrial equipment during a representative average use cycle and must not be unduly burdensome to conduct. Moreover, if the test procedure is for determining estimated annual operating costs, it must provide that such costs will be calculated from measurements of energy use in a representative average-use cycle, and from representative average unit costs of the energy needed to operate the equipment during such cycle. The Secretary must provide information to manufacturers of covered equipment regarding representative average unit costs of energy.

[18] ASHRAE Standard 90.1-2013 technically cites "AHRI 210/240-200 with Addendum 1 and 2." However, DOE believes that this is an editorial error and that ASHRAE meant to cite AHRI 210/240-2008, which is the most recent published year of that test procedure.

1. Updates to the AHRI 210/240 Test Method

In 2011 and 2012, AHRI published Addendum 1 and Addendum 2, updating AHRI Standard 210/240-2008. AHRI Standard 210/240, Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment, is incorporated by reference as the DOE test procedure for small commercial air conditioners and air-source heat pumps with a cooling capacity below 65,000 Btu/h at 10 CFR 431.95. Although ASHRAE 90.1-2013 referenced the addenda to the 2008 version for the first time, the changes contained in the addenda[19] were previously evaluated by DOE and adopted as part of a seven year test procedure review (conducted pursuant to 42 U.S.C. 6314(a)(1)(A)) in a final rule for commercial heating, air-conditioning, and water heating equipment, published in the Federal Register on May 16, 2012. 77 FR 28928. In that test procedure amendment, DOE concluded that the addenda would not impact the Federal energy efficiency ratings for small commercial air conditioners and heat pumps, and it proceeded to incorporate AHRI Standard 210/240-2008 with Addendum 1 and Addendum 2. 77 FR 28928, 28943, 28989 (May 16, 2012). Because DOE has already incorporated by reference the most recent AHRI 210/240 addenda referenced by ASHRAE Standard 90.1-2013, DOE does not need to take action at this time.

2. Updates to the AHRI 340/360 Test Method

In 2010 and 2011, AHRI published Addendum 1 and Addendum 2, respectively, updating AHRI 340/360-2007. AHRI Standard 340/360, Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment, is incorporated by reference as the DOE test procedure for small, large, and very large commercial air conditioners and air-

[19] The addenda to AHRI 210/240-2008 generally replace any references to the part-load metric (i.e., integrated part load value (IPLV)) with references to the new part load metric (i.e., IEER). 77 FR 28928, 28943.

source heat pumps with a cooling capacity greater than or equal to 65,000 Btu/h at 10 CFR 431.95. Although ASHRAE 90.1-2013 referenced the addenda to the 2007 version for the first time, the changes contained in the addenda[20] were previously evaluated by DOE and adopted as part of a seven-year test procedure look back in a final rule for commercial heating, air-conditioning, and water heating equipment, published in the Federal Register on May 16, 2012, 77 FR 28928. In that test procedure amendment, DOE concluded that the addenda would not impact the Federal energy efficiency ratings for small, large, and very large commercial air conditioners and heat pumps, and it proceeded to incorporate AHRI 340/360 with Addendum 1 and Addendum 2. 77 FR 28928, 28943, 28989 (May 16, 2012). Because DOE has already incorporated by reference the most recent AHRI 340/360 addenda referenced by ASHRAE Standard 90.1-2013, DOE does not need to take action at this time.

3. Updates to the AHRI 1230 Test Method

In 2011, AHRI published Addendum 1, updating AHRI Standard 1230-2010. AHRI Standard 1230, Performance Rating of Variable Refrigerant Flow (VRF) Multi-Split Air-Conditioning and Heat Pump Equipment, is incorporated by reference into the DOE test procedure for variable refrigerant flow multi-split systems at 10 CFR 431.95. Although ASHRAE 90.1-2013 referenced the addenda to the 2010 version for the first time, DOE incorporated by reference AHRI 1230-2010 with Addendum 1 in a final rule for commercial heating, air-conditioning, and water heating equipment, published in the Federal Register on May 16, 2012, 77 FR 28928, 28989. Because DOE has already incorporated by reference the

[20] The addenda to AHRI 340/360-2007 expand the scope of the standard to include air-cooled package unitary air conditioners with cooling capacities from 250,000 Btu/h to less than 760,000 Btu/h, add a -0.00 inch H_2O to a 0.05 inch H_2O tolerance to the external static pressure test condition, and add an external static pressure equation and a tolerance to the leaving dry-bulb temperature to the IEER part-load test. 77 FR 28928, 28943.

most recent AHRI 1230 edition and addendum referenced by ASHRAE Standard 90.1-2013, DOE does not need to take action at this time.

4. Updates to the ANSI Z21.47 Test Method

In 2012, ANSI updated ANSI Z21.47, Standard for Gas-Fired Central Furnaces. DOE's test procedure for measuring the energy efficiency of gas-fired warm air furnaces incorporates by reference ANSI Z21.47-2006 at 10 CFR 431.75, but the uniform test method set out at 10 CFR 431.76 only directs one to use those procedures contained in ANSI Z21.47-2006 that are relevant to the steady-state efficiency measurement (i.e., sections 1.1, 2.1 through 2.6, 2.39, and 4.2.1 of ANSI Z21.47). As a result, DOE focused its test procedure review on the relevant sections of ANSI Z21.47 that DOE's test procedure references. In those sections referenced by DOE's test procedures, ANSI did not make any updates. Therefore, DOE has preliminarily determined that the changes to ANSI Z21.47-2012 are not relevant to the DOE test procedure for gas-fired warm air furnaces and, therefore, do not impact the energy efficiency ratings for gas-fired furnaces. Consequently, no further action is required at this time. DOE seeks comments regarding this tentative conclusion. This is identified as Issue 5 in section IV.B, "Issues on Which DOE Seeks Comment."

5. Updates to the ANSI Z21.10.3 Test Method

In 2011, ANSI updated ANSI Z21.10.3, Gas Water Heaters, Volume III, Storage Water Heaters with Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous. DOE's test procedure for gas-fired water heaters incorporates by reference ANSI Z21.10.3-2011 at 10 CFR 431.105, but the uniform test method set out at 10 CFR 431.106 only directs one to use sections G1 (Method of Test for Measuring Thermal Efficiency) and G2 (Method of Test for Measuring Standby Loss) of the ANSI Z21.10.3 test procedure. Although ASHRAE 90.1-2013 referenced the 2011 version for the first time, the version was previously evaluated by DOE and adopted[21] as part of a 7-year test procedure review (conducted pursuant to 42 U.S.C. 6314(a)(1)(A)) in a final rule for commercial heating, air-conditioning, and water heating equipment, published in the Federal Register on May 16, 2012. 77 FR 28928. In that test procedure amendment, DOE concluded that the new version would not alter the DOE test method or the energy efficiency ratings for commercial water heaters as compared to adopting ANSI Z21.10.3-2004, and it proceeded to incorporate ANSI Z21.10.3-2011 by reference. 77 FR 28928, 28944, 28996 (May 16, 2012). Because DOE has already incorporated by reference ANSI Z21.10.3-2011, the test procedure referenced by ASHRAE Standard 90.1-2013, DOE does not need to take action at this time.

III. Analysis of Potential Energy Savings

As required under 42 U.S.C. 6313(a)(6)(A), DOE performed an analysis to determine the energy-savings potential of amending Federal energy conservation standard levels to the efficiency levels specified in ASHRAE Standard 90.1-2013, as well as to more-stringent efficiency levels than those specified in ASHRAE Standard 90.1-2013. As explained previously, DOE's energy-savings analysis is limited to types of equipment covered by Federal energy conservation standards for which the amended ASHRAE Standard 90.1-2013 increase the efficiency levels and for which a market exists and sufficient data are available.[22] Based upon

[21] DOE also adopted a correction regarding Figures 2 and 3 in Exhibit G of ANSI Z21.10.3-2011.
[22] As discussed in section II, when no products are available on the market or no reliable data exist for calculating potential energy savings, DOE did not perform an analysis. The products for which ASHRAE Standard 90.1-2013 increase the efficiency level, but for which DOE did not perform an analysis due to lack of a market or lack of data

the conclusions reached in section II, DOE is conducting the energy-savings analysis for:

- Three equipment classes of small air-cooled, three-phase commercial packaged air-conditioning and heating equipment: (1) single-package air conditioners less than 65,000 Btu/h, (2) single-package heat pumps less than 65,000 Btu/h, and (3) split system heat pumps less than 65,000 Btu/h;
- Three equipment classes of small commercial water-source heat pumps: (1) less than 17,000 Btu/h, (2) 17,000 to less than 65,000 Btu/h, and (3) 65,000 to less than 135,000 Btu/h;
- Three equipment classes of standard size PTACs: (1) less than 7,000 Btu/h, (2) 7,000 to 15,000 Btu/h, and (3) greater than 15,000 Btu/h;
- Three equipment classes of SPVUs: (1) SPVACs less than 65,000 Btu/h, (2) SPVHPs less than 65,000 Btu/h, and (3) SPVACs 65,000 to less than 135,000 Btu/h; and
- One equipment class of commercial water-heating equipment: (1) oil-fired storage water heaters greater than 105,000 Btu/h and less than 4,000 Btu/h/gal.

The following discussion provides an overview of the energy-savings analysis conducted for these 13 classes of equipment, followed by summary results of that analysis. For each efficiency level analyzed, DOE calculated the potential energy savings to the Nation as the difference between a base-case projection (without amended standards) and the standards-case projection (with amended standards). The national energy savings (NES) refers to cumulative lifetime energy savings for equipment purchased in a 30-year period that differs by equipment

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include: (1) SPVHP 65,000 to less than 135,000 Btu/h; (2) SPVAC 135,000 to less than 240,000 Btu/h; and (3) SPVHP 135,000 to less than 240,000 Btu/h. (See section II.A.5.)

(i.e., the compliance date differs by equipment class because of the ASHRAE trigger legal requirements). The analysis is based on a stock accounting method. In the standards case, equipment that is more efficient gradually replaces less-efficient equipment over time. This affects the calculation of the potential energy savings, which are a function of the total number of units in use and their efficiencies. Savings depend on annual shipments and equipment lifetime. Inputs to the energy-savings analysis are presented below, and details are available in the ASHRAE NODA technical support document (TSD) on DOE's website.[23]

A. Annual Energy Use

This section describes the energy use analysis performed for each type of equipment. The Federal standard and higher efficiency levels are expressed in terms of an efficiency metric or metrics. For each equipment class, this section describes how DOE developed estimates of annual energy consumption at the baseline efficiency level and at higher levels for each equipment type. These annual unit energy consumption (UEC) estimates form the basis of the national energy savings estimates discussed in section III.E. More detailed discussion is found in the ASHRAE NODA TSD.

1. Small Commercial Packaged Air Conditioners and Heat Pumps

To estimate the UEC for each class of small commercial packaged air conditioning and heating equipment less than 65,000 Btu/h (air-cooled, three-phase), DOE began with the cooling UECs for single-phase equipment installed in commercial buildings as presented in the national impact analysis associated with the 2010 notice of public meeting and availability of preliminary

[23] The ASHRAE NODA TSD is available on the webpage for ASHRAE Products at: http://www1.eere.energy.gov/buildings/appliance_standards/rulemaking.aspx?ruleid=90

technical support document for residential central air conditioners and heat pumps. (EERE–2008–BT–STD–0006-0003). DOE believes that three-phase commercial equipment would have similar energy usage to single-phase equipment, as it would tend to be used in similar locations and in a similar manner. DOE seeks comment on this assumption, which is identified as Issue 6 in section IV.B, "Issues on Which DOE Seeks Comment."

In the 2010 analysis, the UECs for split and single-package systems were very similar (and therefore comparable), but UECs were available for higher efficiency levels for split systems than for single-package equipment. As a result, DOE used the 2010 UECs for split systems for all equipment classes analyzed for today's NODA, including both split and single-package systems.

Although ASHRAE 90.1-2013 increased the HSPF levels for this equipment, DOE did not include heating UECs in this analysis. For commercial installations in the 2010 analysis, DOE determined that the heating UECs did not scale proportionally with HSPF. Based on these data, DOE has preliminarily determined that using available data to quantify energy savings related to increasing HSPF for small commercial heat pumps is not possible. DOE seeks data and information related to the heating energy use of commercial heat pumps, as related to HSPF, which is identified as Issue 7 in section IV.B, "Issues on Which DOE Seeks Comment."

Table III.1 shows the UEC estimates for the current Federal standards levels (baseline), the ASHRAE 90.1-2013 levels, and the higher efficiency levels for the three small air-cooled commercial packaged air-conditioning and heating equipment classes analyzed. DOE derived the “max-tech” level from the market maximum in the AHRI Certified Directory[24] as of November 2013. However, the highest available efficiency level for split system heat pumps was only 16.2, whereas for single-package units it was 18.05. DOE believes that split system heat pumps are capable of reaching the same efficiency level as single-package units because the same technologies to increase efficiency can be employed for each type of equipment and, therefore, analyzed a “max-tech” level of 18.05 for both single package and split system heat pumps.

Table III.1 National UEC Estimates for Air-Cooled Air Conditioners and Heat Pumps

	Small Three-Phase Air-Cooled Single-Package Air Conditioners <65,000 Btu/h	**Small Three-Phase Air-Cooled Single-Package Heat Pumps <65,000 Btu/h**	**Small Three-Phase Air-Cooled Split System Heat Pumps <65,000 Btu/h**
Efficiency Level (SEER)			
Baseline – Federal Standard	13.0	13.0	13.0
ASHRAE Level (1)	14.0	14.0	14.0
Efficiency Level 2	15.0	15.0	15.0
Efficiency Level 3	16.0	16.0	16.0
Efficiency Level 4	17.5	-	-
Efficiency Level 5 – “Max-Tech” –	19.15	18.05	18.05
UEC (kwh/year)			
Baseline – Federal Standard	2,408	2,418	2,418
ASHRAE Level (1)	2,349	2,387	2,387
Efficiency Level 2	2,237	2,282	2,282
Efficiency Level 3	2,125	2,177	2,177
Efficiency Level 4	2,086	-	-
Efficiency Level 5 – “Max-Tech” –	2,047	2,123	2,123

[24] Available at: http://www.ahridirectory.org/ahridirectory/pages/home.aspx.

2. Water-Source Heat Pumps

To estimate the UEC for each class of water-source heat pump, DOE began with the cooling UECs for water-source heat pumps published in Appendix D of the 2000 Screening Analysis for EPACT-Covered Commercial HVAC and Water-Heating Equipment. (EERE-2006-STD-0098-0015) Where identical efficiency levels were available, DOE used the UEC directly from the screening analysis. For additional efficiency levels, DOE scaled the UECs based on the ratio of EER, as was done in the original analysis. DOE seeks comment on the appropriateness of the cooling UECs derived from the 2000 screening analysis, adjusted based on equipment EER to be inversely proportional to EER, including whether energy use for this equipment would have changed significantly since the last analysis. This is identified as Issue 8 in section IV.B, "Issues on Which DOE Seeks Comment."

Although ASHRAE 90.1-2013 increased the COP levels for this equipment, DOE did not include heating UEC in this analysis as a result of lack of information regarding the heating-mode energy use of this equipment. DOE seeks data and information related to water-source heat pump heating energy use. This is identified as Issue 9 in section IV.B, "Issues on Which DOE Seeks Comment."

Table III.2 shows the UEC estimates for the current Federal standard levels, the ASHRAE 90.1-2013 levels, and the higher efficiency levels for the three water-source heat pump classes analyzed. The "max-tech" levels represent the market maximum identified in the AHRI Certified Directory as of November 2013.[25]

[25] For variable-capacity models listed at both minimum and maximum capacity, DOE analyzed the efficiency of the maximum capacity only.

Table III.2 National UEC Estimates for Water-Source Heat Pumps

	Water-Source Heat Pumps <17,000 Btu/h	Water-Source Heat Pumps ≥17,000 and <65,000 Btu/h	Water-Source Heat Pumps ≥65,000 and <135,000 Btu/h
Efficiency Level (EER)			
Baseline – Federal Standard	11.2	12.0	12.0
ASHRAE Level (1)	12.2	13.0	13.0
Efficiency Level 2	13.0	14.6	14.0
Efficiency Level 3	14.0	16.6	15.0
Efficiency Level 4	15.7	18.0	16.0
Efficiency Level 5	16.5	19.2	-
Efficiency Level 6 – "Max-Tech" –	18.1	21.6	17.2
UEC (kwh/year)			
Baseline – Federal Standard	1,738	4,868	11,528
ASHRAE Level (1)	1,595	4,493	10,641
Efficiency Level 2	1,497	4,001	9,881
Efficiency Level 3	1,390	3,519	9,223
Efficiency Level 4	1,240	3,245	8,646
Efficiency Level 5	1,180	3,042	-
Efficiency Level 6 – "Max-Tech" –	1,075	2,704	8,043

3. Packaged Terminal Air Conditioners

To estimate the UEC for each class of PTACs, DOE began with the cooling UECs for PTACs used in the 2008 energy conservation standards final rule. 73 FR 58772 (Oct. 7, 2008). With the UECs given for each State, the population of each State was used to weight the UECs to obtain a nationally representative UEC. Where identical efficiency levels and cooling capacities were available, DOE used the UEC directly from the rulemaking. For additional efficiency levels, DOE scaled the UECs based on interpolations between EERs at a constant cooling capacity. Likewise, for additional cooling capacities, DOE scaled the UECs based on interpolations between cooling capacities at constant EER.

Table III.3 shows the UEC estimates for the current Federal standard levels, the ASHRAE 90.1-2013 levels, and the higher efficiency levels for the three PTAC classes analyzed. The "max-tech" levels correspond to those in the PTAC Framework Document published in 2013. 78 FR 12252 (Feb. 22, 2013) (EERE-2012-BT-STD-0029-0002).

Table III.3 National UEC Estimates for PTACs

	PTAC <7,000 Btu/h	PTAC ≥7,000 and ≤15,000 Btu/h	PTAC >15,000 Btu/h
Efficiency Level (EER)			
Baseline – Federal Standard	11.7	11.1	9.3
ASHRAE Level (1)	11.9	11.3	9.5
Efficiency Level 2	12.2	11.5	9.7
Efficiency Level 3	12.6	12.0	10.0
Efficiency Level 4	13.1	12.4	10.4
Efficiency Level 5	13.6	12.9	10.8
Efficiency Level 6 – "Max-Tech" –	14.0	13.3	11.2
UEC (kwh/year)			
Baseline – Federal Standard	849	1,026	1,607
ASHRAE Level (1)	838	1,014	1,591
Efficiency Level 2	824	1,000	1,577
Efficiency Level 3	799	973	1,547
Efficiency Level 4	773	946	1,517
Efficiency Level 5	748	919	1,487
Efficiency Level 6 – "Max-Tech" –	723	892	1,458

4. Single-Package Vertical Air Conditioners and Heat Pumps

Based on information received from manufacturer interviews conducted in preparation for the forthcoming SPVU NOPR, DOE has determined that approximately 35 percent of SPVAC shipments go to educational facilities, and the majority of those installations are for space conditioning of modular classroom buildings. Another approximately 35 percent of the shipments go to providing cooling for telecommunications and electronics enclosures. The remainder of the shipments (30 percent) is used in a wide variety of commercial buildings, including offices, temporary buildings, and some miscellaneous facilities. In almost all of these commercial building applications, the buildings served are expected to be of modular construction, because SPVUs, as packaged air conditioners installed on external building walls, do not impact site preparation costs for modular buildings, which may be relocated multiple times over the building's life. The vertically-oriented configuration of SPVUs allows the building mounting to be unobtrusive and minimizes impacts on modular building transportation requirements. These advantages do not apply to a significant extent to site-constructed buildings. DOE further understands that shipments of SPVHP equipment would primarily be to educational facilities or office-type end uses but would be infrequently used for telecommunication or electronic enclosures for which the heating requirements are often minimal.

DOE analyzed energy use in three different classes of commercial buildings that utilize SPVU equipment: (1) modular classrooms; (2) modular offices; and (3) telecommunication shelters. To estimate the energy use of SPVU equipment in these building types, DOE developed building simulation models for use with DOE's EnergyPlus software.[26] A prototypical building model was developed for each building type, described by the building footprint, general building size, and design. The building types were represented by a 1,568 ft^2 wood-frame modular classroom, a 1,568 ft^2 wood-frame modular office, and a 240 ft^2 concrete-wall telecommunications shelter. In each case, the building construction (footprint, window-wall ratio, general design) was developed to be representative of typical designs within the general class of building. Operating schedules, internal load profiles, internal electric receptacle (plug) loads, and occupancy for the modular classroom were based upon classroom-space-type data found in the DOE Primary School commercial prototype building model.[27] Operating schedules, internal load profiles, internal plug loads, and occupancy for modular office buildings were those from office space in the DOE Small Office commercial prototype building model. Id. For the telecommunications shelter, DOE did not identify a source for typical representative internal electronic loads as a function of building size, nor did it find information on representative internal gain profiles. However, based on feedback from shelter manufacturers, DOE used a 36,000 Btu/h (10.55 kW) peak internal load to reflect internal design load in the shelter. DOE determined that, on average over the year, this load ran at a scheduled 65 percent of peak value, reflecting estimates for computer server environments.[28] Each of these three building models was used to establish the energy usage of SPVAC and SPVHP equipment in the same building class.

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[26] EnergyPlus Energy Simulation Software and documentation are available at: http://apps1.eere.energy.gov/buildings/energyplus/.

[27] The commercial prototype building models are available on DOE's website as Energy Plus input files at: http://www.energycodes.gov/development/commercial/90.1_models. Documentation of the initial model development is provided in:
Deru, M., *et al*., U.S. Department of Energy Commercial Reference Building Models of the National Building Stock, NREL/TP-5500-46861 (2011).

[28] EnergyConsult Pty Ltd., Equipment Energy Efficiency Committee Regulatory Impact Statement Consultation Draft: Minimum Energy Performance Standards and Alternative Strategies for Close Control Air Conditioners, Report No 2008/11 (2008) (Available at: www.energyrating.gov.au).

Envelope performance (e.g., wall, window, and roof insulation, and window performance) and lighting power inputs were based on requirements in ASHRAE Standard 90.1-2004.[29] DOE believes that the requirements in ASHRAE Standard 90.1-2004 are sufficiently representative of a mixture of both older and more recent construction and that resulting SPVU equipment loads will be representative of typical SPVU equipment loads in the building stock. Ventilation levels were based on ASHRAE Standard 62.1-2004.[30]

DOE simulated each building prototype in 237 U.S. climate locations, taking into account variation in building envelope performance for each climate as required by ASHRAE 90.1-2004. For simulations used to represent SPVU equipment of less than 65,000 Btu/h, no outside air economizers were assumed for the modular office and modular classroom buildings.[31] However, for simulations used to represent equipment of greater than or equal to 65,000 Btu/h but less than 135,000 Btu/h, economizer usage was presumed to be climate-dependent in these building types, based on ASHRAE Standard 90.1-2004 requirements for unitary equipment in that capacity range. For the telecommunications shelter, economizers were assumed for 45 percent of buildings, based on manufacturer interviews. In addition, for the telecommunications shelter, redundant identical air conditioners with alternating usage were assumed when establishing average annual energy consumption per unit.

[29] American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), Energy Standard for Buildings Except Low-Rise Residential Buildings, ANSI/ASHRAE/IESNA Standard 90.1-2004 (2005).

[30] American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), Ventilation for Acceptable Indoor Air Quality, ANSI/ASHRAE/IESNA Standard 62.1-2004 (2004).

[31] An "outside air economizer" is a combination of ventilation and exhaust air dampers and controls that increase the amount of outside air brought in to a building when the outside air conditions (i.e., temperature and humidity) are low, such that increasing the amount of ventilation air reduces the equipment cooling loads.

Simulations were done for the buildings using SPVAC equipment and electric resistance heating, and then a separate set of simulations was done for buildings with SPVHP equipment. For each equipment type and building type combination, DOE simulated each efficiency level identified in the engineering analysis for each equipment class. Fan power at these efficiency levels was based on manufacturers' literature and reported fan power consumption data as developed in the engineering analysis. Brushless permanent magnet (BPM) supply air blower motors were assumed at an EER of 10.0 and higher for all classes of equipment based on results from the engineering analysis. The supply air blower motors are assumed to run at constant speed and constant power while operating.

DOE used typical meteorological weather data (TMY3) for each location in the simulations.[32] DOE sized equipment for each building simulation using a design-day sizing method incorporating the design data found in the EnergyPlus design-day weather data files for each climate.[33] DOE also incorporated an additional cooling sizing factor of 1.1 for the equipment used in the modular office and modular classroom simulations, reflective of the typical sizing adjustment needed to account for discrete available equipment capacities in SPVAC and SPVHP equipment.

EER and heating COP were converted to corresponding simulation inputs for each efficiency level simulated. These inputs, along with the calculated fan power at each efficiency level, were used in the building simulations. Further details of the building model and the

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[32] Wilcox S. and W. Marion, User's Manual for TMY3 Data Sets, National Renewable Energy Laboratory, Report No. NREL/TP-581-43156 (2008).
[33] EnergyPlus TMY3-based weather data files and design-day data files available at: http://apps1.eere.energy.gov/buildings/energyplus/weatherdata_about.cfm.

simulation inputs for the SPVAC and SPVHP equipment can be found in chapter 3 of the NODA TSD.

From the annual simulation results for SPVAC equipment, DOE extracted the condenser energy use for cooling, the supply air blower energy use for both heating and cooling hours, the electric resistance heating energy, and the equipment capacity for each building type, climate, and efficiency level. From these, DOE developed corresponding normalized annual cooling energy per cooling ton and annual blower energy per ton for the efficiency levels simulated. DOE also developed the electrical heating energy per ton for the building. These per-ton cooling and blower energy values were added together and then multiplied by the average cooling capacity estimated for the equipment class simulated to arrive at an initial energy consumption estimate for SPVAC. In a deviation from the 2011 NODA analysis, DOE also noted that, where fan power was reduced for higher efficiency levels, there was a corresponding increase in the amount of heating required in each climate to make up for the loss of heat energy imparted into the supply air stream through the use of the more-efficient supply air blower during the heating season. This impact was climate dependent, with little heating impact in warm climates, and greater heating impact in cold climates where heating energy requirements dominate during the year. DOE calculated this heating "take back" effect for higher efficiency levels as a deviation from the baseline heating energy use for each equipment capacity. The final SPVAC energy consumption estimates were then based on the calculated cooling and supply blower energy uses plus this heating take back, which allowed the resulting energy savings estimates to correctly account for the heating energy increase during the year. In addition, it was estimated that 5 percent of the market for the class of SPVAC less than 65,000 Btu/h utilize gas furnace heating.

The heating take back for these systems was estimated based on the heating load of the systems with electric resistance heat and assuming an average 81-percent furnace annual fuel utilization efficiency (AFUE).

The analytical method for SPVHP was carried out in a similar fashion; however, for heat pumps, DOE included the heating energy (compressor heating and electric resistance backup) directly from the simulation results and, thus, did not separately calculate a heating take back effect. From these data, DOE developed per-ton energy consumption values for cooling, supply blower, and heating electric loads. These per-ton energy figures were summed and multiplied by the nominal capacity for the equipment class simulated to arrive at the annual per-ton energy consumption for SPVHP for each combination of building type, climate, and efficiency level.

For each combination of equipment class, building type, climate, and efficiency level, DOE developed UEC values for each State using weighting factors to establish the contribution of each climate in each State. National average UEC estimates for each equipment class and efficiency level were also established based on population-based weighting across States and shipment weights to the different building types. With regard to the latter, while DOE established shipment weights for SPVAC equipment related to the three building types (educational, office, and telecommunications), DOE determined that SPVHP equipment was not used to a significant extent in telecommunications facilities and, thus, only allocated shipments of SPVHP equipment to two building types, educational and office.

For details of this energy use analysis, see chapter 3 of the NODA TSD.

Table III.4 shows the annual UEC estimates for SPVAC and SPVHP corresponding to the efficiency levels analyzed. For all levels above the baseline, SPVAC less than 65,000 Btu/h also include a heating take-back UEC of 53 kBtu/year.

Table III.4 National UEC Estimates for SPVUs

	SPVAC <65,000 Btu/h	SPVHP <65,000 Btu/h	SPVAC ≥65,000 and <135,000 Btu/h
Efficiency Level (EER)			
Baseline – Federal Standard	9.0	9.0	8.9
ASHRAE Level (1)	10.0	10.0	10.0
Efficiency Level 2	10.5	10.5	-
Efficiency Level 3	11.0	11.0	-
Efficiency Level 4	11.8	11.8	-
Efficiency Level 5 – "Max-Tech" –	12.3	12.3	-
UEC (kwh/year)			
Baseline – Federal Standard	6,814	20,222	13,604
ASHRAE Level (1)	6,113	19,689	12,119
Efficiency Level 2	5,864	19,236	-
Efficiency Level 3	5,638	18,951	-
Efficiency Level 4	5,335	18,115	-
Efficiency Level 5 – "Max-Tech" –	5,136	17,977	-

DOE seeks input on its analysis of UECs for these equipment classes and its use in establishing the energy savings potential for higher standards. Of particular interest to DOE is input on shipments of SPVHP equipment to telecommunications shelters and the frequency of use of economizers in equipment serving these shelters. DOE also recognizes that there may be regional differences between the shipments of heat pumps and air conditioners to warmer or cooler climates and requests stakeholder input on how, or if, such differences can be taken into account in the energy use characterization. DOE identified these topics as Issues 10 and 11 under "Issues on Which DOE Seeks Comment" in section IV.B of this NODA.

5. Commercial Water Heaters

To provide an estimate of the UEC of commercial oil-fired storage water heaters (greater than 105,000 Btu/h and less than 4,000 Btu/h/gal), DOE calculated the shipment-weighted average UEC of gas-fired commercial storage water heaters using data in the 2000 Screening Analysis for EPACT-Covered Commercial HVAC and Water-Heating Equipment. (EERE-2006-STD-0098-0015) DOE then calculated the ratio of UEC of oil-fired to gas-fired commercial water heaters based on the water heating information derived from the Energy Information Administration's 2003 Commercial Buildings Energy Consumption Survey.[34] DOE applied this ratio to the shipment-weighted average UEC of gas-fired commercial storage water heaters to arrive at the UEC of oil-fired commercial storage water heaters. DOE assumed this UEC corresponded to the baseline efficiency of 78 percent. For additional efficiency levels above 78 percent, DOE scaled the UECs based on the ratio of thermal efficiency at the baseline and each specific efficiency level. DOE seeks comment on its approach to estimating UECs for oil-fired commercial storage water heaters. DOE has identified this topic as Issue 12 under "Issues on Which DOE Seeks Comment" in section IV.B of this NODA.

Table III.5 shows the UEC estimates for the current Federal standard levels, the ASHRAE 90.1-2013 levels, and the higher efficiency levels for oil-fired commercial storage water heaters.

[34] U.S. Department of Energy: Energy Information Administration, Commercial Buildings Energy Consumption Survey (2003) (Last accessed Jan. 2014) (Available at: <http://www.eia.doe.gov/emeu/cbecs/>).

Table III.5 National UEC Estimates for Commercial Water-Heating Equipment

	Oil-Fired Storage Water-Heating Equipment (>105,000 Btu/h and <4,000 Btu/h/gal)
Efficiency Level (E_t)	
Baseline – Federal Standard	78%
ASHRAE Level (1)	80%
Efficiency Level 2	81%
Efficiency Level 3 – "Max-Tech" –	82%
UEC (MMBtu/year)	
Baseline – Federal Standard	131
ASHRAE Level (1)	128
Efficiency Level 2	126
Efficiency Level 3 – "Max-Tech" –	125

B. Shipments

1. Small Commercial Air Conditioners and Heat Pumps

DOE previously estimated shipments of air-cooled, three-phase equipment less than 65,000 Btu/h by equipment class for the year 1999 as part of the 2000 Screening Analysis for EPACT-Covered Commercial HVAC and Water-Heating Equipment. (EERE-2006-STD-0098-0015) Table III.6 shows these data. While the U.S. Census provides shipments data for air-cooled equipment less than 65,000 Btu/h, it does not disaggregate the shipments into single-phase and three-phase. Therefore, DOE used the Census data from 1999 to 2010[35] as a trend from which to extrapolate DOE's 1999 estimated shipments data (which is divided by equipment

[35] U.S. Census Bureau. Current Industrial Reports for Refrigeration, Air Conditioning, and Warm Air Heating Equipment, MA333M. Note that the current industrial reports were discontinued in 2010, so more recent data are not available. Available at: http://www.census.gov/manufacturing/cir/historical_data/ma333m/index.html.

class) for three-phase equipment for the time period from 2000 to 2010. DOE then used the estimated shipments from 1999 to 2010 to establish a trend from which to project shipments beyond 2010. For heat pumps, DOE used a linear trend, which is slightly decreasing for single-package units and increasing for split systems. However, for single-package air conditioners, the trend was precipitously declining. As a result, for single-package air conditioners for the years after 2010, DOE used the average value from 1999 to 2010. The full time series of shipments can be found in the ASHRAE NODA TSD.

Table III.6 DOE Estimated Shipments of Small Three-Phase Commercial Air Conditioners and Heat Pumps <65,000 Btu/h

Equipment Class	1999
Single-Package AC	213,728
Single-Package HP	27,773
Split System HP	11,903

2. <u>Water-Source Heat Pumps</u>

The U.S. Census published historical (1980, 1983-1994, 1997-2006, and 2008-2010) water-source heat pump shipment data.[36] Table III.7 exhibits the shipment data provided for a selection of years. DOE analyzed data from the years 1990-2010 to establish a trend from which to project shipments beyond 2010. DOE used a linear trend. Because the Census data do not distinguish between equipment capacities, DOE used the shipments data by equipment class provided by AHRI in 1999, and published in the 2000 Screening Analysis for EPACT-Covered Commercial HVAC and Water-Heating Equipment (EERE-2006-STD-0098-0015), to distribute the total water-source heat pump shipments to individual equipment classes. Table III.8 exhibits the shipment data provided for 1999. DOE assumed that this distribution of shipments across the

[36] *Id.*

various equipment classes remained constant and has used this same distribution in its projection of future shipments of water-source heat pumps. The complete historical data set and the projected shipments for each equipment class can be found in the ASHRAE NODA TSD.

Table III.7 Total Shipments of Water-Source Heat Pumps (Census Product Code: 333415E181)

Equipment Class	1989	1999	2009
Total	157,080	120,545	180,101

Table III.8 Total Shipments of Water-Source Heat Pumps (AHRI)

Equipment Class	1999	Percent
WSHP <17000 Btu/h	41,000	31%
WSHP 17000-65000 Btu/h	86,000	65%
WSHP 65000-135000 Btu/h	5,000	4%

DOE notes that an EIA report on geothermal heat pump manufacturers[37] shows shipments of water-source units (defined by EIA as those tested to ARI-320) as only 22,009 in 2009 and 7,808 in 2000, which is significantly less than that reported by the Census (product code 333415E181**)** and by AHRI. DOE notes that both the Census data and the EIA report show consistent shipments of separately-reported ground-source and ground-water-source heat pumps (listed as Census product code 333415G and defined by EIA as those tested to ARI-325/330) at approximately 87,000 shipments in 2009; DOE is not counting these shipments in its estimates as reported in Table III.7. DOE believes that water-source heat pumps operate with a water loop using a boiler or chiller as the heat source or sink, and that, therefore, may not be considered "geothermal;" in this case, the EIA report may not include a comprehensive number of water-source heat pump shipments.

[37] U.S. Energy Information Administration, Geothermal Heat Pump Manufacturing Activities 2009 (2010) (Available at: http://www.eia.gov/renewable/renewables/geothermalrpt09.pdf).

DOE seeks comment on the market for water-source heat pumps, especially what magnitude of annual shipments is most accurate, and how shipments are expected to change over time. DOE also seeks comment on the share of the market for ground-source and ground-water-source heat pump applications that use models also rated for water-loop application. DOE identified these as Issues 13 and 14 under "Issues on Which DOE Seeks Comment" in section IV.B of this NODA.

3. Packaged Terminal Air Conditioners

To estimate yearly shipments of PTACs, DOE examined new construction and replacement shipments. New construction shipments were calculated using projected new construction floor space of healthcare, lodging, and small office buildings from the Annual Energy Outlook 2013 (AEO 2013)[38] and historical saturation data, which were calculated from historical shipments data and historical new construction floor space as shown in Table III.9. Replacement shipments equaled the number of units that failed in a given year, based on a stock model and distribution of equipment lifetimes. DOE determined the distribution of shipments among the equipment classes using shipments data by equipment class provided by AHRI for the 2008 PTAC and PTHP rulemaking, as shown in Table III.10.[39]

Table III.9 Historical PTAC and PTHP Shipments with New Construction Floor Space Values Used to Calculate Saturation

[38] AEO 2013 can be accessed at: http://www.eia.gov/forecasts/archive/aeo13/index.cfm.
[39] U.S. Department of Energy – Office of Energy Efficiency and Renewable Energy. Energy Conservation Program for Commercial and Industrial Equipment: Packaged Terminal Air Conditioner and Packaged Terminal Heat Pump Energy Conservation Standards (Available at: <http://www.regulations.gov/#!docketDetail;D=EERE-2007-BT-STD-0012>).

Year	Health care (million s.f.)	Lodging (million s.f.)	Small Office (million s.f.)	Total (million s.f.)	New Construction Shipments	Saturation (units/ million s.f.)
2000	68	172	179	419	66,407	6,315

Table III.10 Shipments of PTACs by Equipment Class (AHRI)

	PTAC			PTHP		
	<7,000 Btu/h	≥7,000 - ≤15,000 Btu/h	>15,000 Btu/h	<7,000 Btu/h	≥7,000 - ≤15,000 Btu/h	>15,000 Btu/h
1998-2004 Average Shipments	12,898	205,355	15,407	7,702	168,068	13,534
Percent	3%	48%	4%	2%	40%	3%

4. <u>Single-Package Vertical Air Conditioners and Heat Pumps</u>

To develop the SPVU shipments model, DOE started with 2005 shipment estimates from the Air-Conditioning and Refrigeration Institute (ARI, now AHRI) for units less than 65,000 Btu/h as published in a previous rulemaking[40] (more recent data are not available). Table III.11 shows these data.

Table III.11 Total Shipments of Single Package Vertical Units

Equipment Class	2005
SPVAC <65,000 Btu/h, single-phase	31,976
SPVAC <65,000 Btu/h, three-phase	13,125
SPVHP <65,000 Btu/h, single-phase	14,301
SPVHP <65,000 Btu/h, three-phase	6,129

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[40] U.S. Department of Energy—Office of Energy Efficiency and Renewable Energy, Technical Support Document: Energy Efficiency Program for Commercial and Industrial Equipment: Efficiency Standards for Commercial Heating, Air-Conditioning, and Water Heating Equipment Including Packaged Terminal Air-Conditioners and Packaged Terminal Heat Pumps, Small Commercial Packaged Boiler, Three-Phase Air-Conditioners and Heat Pumps <65,000 Btu/h, and Single-Package Vertical Air Conditioners and Single-Package Vertical Heat Pumps <65,000 Btu/h (March 2006) (Available at: http://www1.eere.energy.gov/buildings/appliance_standards/commercial/pdfs/ashrae_products/ashrae_products_draft_tsd_030206.pdf). This TSD was prepared for the rulemaking that resulted in the Final Rule: Energy Efficiency Program for Certain Commercial and Industrial Equipment: Efficiency Standards for Commercial Heating, Air-Conditioning, and Water-Heating Equipment. 72 FR 10038 (March 7, 2007).

DOE added additional shipments for SPVACs greater than or equal to 65,000 Btu/h and less than 135,000 Btu/h, which make up 3 percent of the market, based on manufacturer interviews. As there are no models on the market for SPVHP greater than or equal to 65,000 Btu/h and less than 135,000 Btu/h, or for any SPVUs greater than or equal to 135,000 Btu/h, DOE did not develop shipments estimates (or generate NES) for these equipment classes. See chapter 4 of the NODA TSD for more details on the initial shipment estimates by equipment class that were used as the basis for the shipments projections discussed subsequently.

To project shipments of SPVUs for new construction (starting in 2006), DOE relied primarily on sector-based estimates of saturation and projections of floor space. Based on manufacturer interview information, DOE allocated 35 percent of shipments to the education sector, 35 percent to telecom, and 30 percent to offices. DOE used the 2005 new construction shipments and 2005 new construction floor space for offices and education (from AEO 2013) to estimate a saturation rate for each end use.[41] DOE applied this saturation rate to AEO 2013 projections of new construction floor space to project shipments to new construction through 2044. For shipments to telecom, DOE developed an index based on County Business Pattern data for establishments[42] and projected this trend forward. To allocate the total projected shipments for office, education, and telecom into the equipment classes, DOE used the fraction of shipments from 2005 for each equipment class. This fraction remained constant over time. The complete discussion of shipment allocation and projected shipments for the different equipment classes can be found in chapter 4 of the NODA TSD.

[41] Manufacturers reported that in 2012, 50 percent of shipments were for new construction. DOE allocated a larger percentage of shipments to new construction in 2005 in order to arrive at 50 percent in 2012.
[42] **U**.S. Census Bureau, County Business Patterns for NAICS 237130 Power and Communication Line and Related Structures Construction (Available at: http://www.census.gov/econ/cbp/index.html) (Last accessed May 2, 2012).

In order to model shipments for replacement SPVUs, DOE developed historical shipments for SPVUs back to 1981 based on an index of square footage production data from the Modular Buildings Institute.[43] Shipments prior to 1994 were extrapolated based on a trend from 2005 to 1997. In the stock model, the lifetime of SPVUs follows a distribution with a minimum of 10 years and a maximum of 25 years (and an average of 15 years). All retired units are assumed to be replaced with new shipments. The complete discussion of the method for extrapolating historical shipments can be found in chapter 4 of the NODA TSD.

5. Commercial Water Heaters

DOE derived the shipments for commercial oil-fired storage water heaters (greater than 105,000 Btu/h and less than 4,000 Btu/h/gal) from the 2000 Screening Analysis for EPACT-Covered Commercial HVAC and Water-Heating Equipment (EERE-2006-STD-0098-0015) and the AHRI model database.[44] The PNNL study estimated the shipments of gas-fired storage water heaters in 1999. DOE estimated that the shipments in 2000 are the same as the shipments in 1999, and then applied a 1% per year growth rate after 2000. To derive the shipments of oil-fired storage water heaters, DOE calculated the ratio of oil- versus gas-fired storage water heaters using the number of models in the AHRI model database, which was 3.3 percent. DOE multiplied this ratio by the shipments of gas-fired storage water heaters to calculate the shipments of oil-fired storage water heaters. The complete series of shipments can be found in chapter 4 of the NODA TSD.

[43] Available at: http://www.modular.org/HtmlPage.aspx?name=analysis (Last accessed May 18, 2012).
[44] Available at: http://www.ahridirectory.org/ahridirectory/pages/home.aspx.

DOE seeks input and data regarding its shipments methodologies and projections for all equipment analyzed in today's NODA. DOE identified this as Issue 15 under "Issues on Which DOE Seeks Comment" in section IV.B of this NODA.

C. Base-Case Efficiency Distribution

DOE reviewed manufacturer interview data (for SPVUs) or the AHRI certified products directory for relevant equipment classes (for all other equipment) to determine the distribution of efficiency levels for commercially-available models within each equipment class analyzed in today's NODA. DOE bundled the efficiency levels into "efficiency ranges" and determined the percentage of models within each range. The distribution of efficiencies in the base case for each equipment class can be found in the ASHRAE NODA TSD.

For the standards case for all equipment in today's NODA, DOE assumed shipments at lower efficiencies were most likely to roll up into higher efficiency levels in response to more-stringent energy conservation standards. For each efficiency level analyzed within a given equipment class, DOE used a "roll-up" scenario to establish the market shares by efficiency level for the year that standards would become effective (e.g., 2015, 2017, or 2020). DOE estimated that the efficiencies of equipment in the base case that did not meet the standard level under consideration would roll up to meet the standard level. Available information also suggests that all equipment efficiencies in the base case that were above the standard level under consideration would not be affected. Table III.12 shows an example of the distribution of efficiencies within the base-case and the roll-up scenarios to establish the distribution of efficiencies in the standards cases for oil-fired commercial storage water heaters. For all the tables of the distribution of efficiencies in the base case and standards cases by equipment class, see the ASHRAE NODA

TSD.

Table III.12 Distribution of Efficiencies in the Base Case and Standards Cases for Oil-Fired Commercial Storage Water Heaters

	Thermal Efficiency (%)			
	78	**80**	**81**	**82**
Base Case	52.6%	23.7%	10.5%	13.2%
ASHRAE 90.1-2013 Standard		76.3%	10.5%	13.2%
Efficiency Level 2			86.8%	13.2%
Max-Tech				100.0%

DOE seeks input on its determination of the base-case distribution of efficiencies and its projection of how amended energy conservation standards would affect the distribution of efficiencies in each standards case. DOE identified this as Issue 16 under "Issues on Which DOE Seeks Comment" in section IV.B of this NODA.

Using the distribution of efficiencies in the base case and in the standards cases for each equipment class analyzed in today's NODA, as well as the UECs for each specified EER, SEER, or thermal efficiency (discussed previously), DOE calculated market-weighted average efficiency values. The market-weighted average efficiency value represents the average efficiency of the total units shipped at a specified amended standard level. The market-weighted average efficiency values for the base case and the standards cases for each efficiency level analyzed within the equipment classes is provided in the ASHRAE NODA TSD.

D. Other Analytical Inputs

1. Conversion of Site Energy Savings

DOE converted the annual site energy savings into the annual amount of energy saved at the source of electric generation (i.e., primary energy) using annual multiplicative factors calculated from the AEO 2013 projections.[45] For electricity, the conversion factors vary over time because of projected changes in generation sources (i.e., the types of power plants projected to provide electricity to the country).

In response to the recommendations of a committee on "Point-of-Use and Full-Fuel-Cycle Measurement Approaches to Energy Efficiency Standards" appointed by the National Academy of Sciences, DOE announced its intention to use full-fuel-cycle (FFC) measures of energy use and greenhouse gas and other emissions in the national impact analyses and emissions analyses included in future energy conservation standards rulemakings. 76 FR 51281 (August 18, 2011). After evaluating analytical models and the approaches discussed in the August 18, 2011 notice, DOE published a statement of amended policy in which DOE explained its determination that the National Energy Modeling System (NEMS) is the most appropriate tool for its FFC analysis and its intention to use NEMS for that purpose. 77 FR 49701 (August 17, 2012). The calculations in today's notice use FFC multipliers derived from NEMS.

2. Equipment Lifetime

DOE defines "equipment lifetime" as the age when a unit is retired from service. DOE reviewed available literature to establish typical equipment lifetimes. For air-cooled equipment, water-source heat pumps, and commercial storage water heaters, DOE used the estimated product lifetimes from the 2000 screening analysis for EPACT-Covered Commercial HVAC and Water-Heating Equipment (EERE-2006-STD-0098-0015). The average lifetime for air-cooled equipment is 15 years, for water-source equipment 19 years, and for water heaters 7 years.

[45] AEO 2013 can be accessed at: http://www.eia.gov/forecasts/archive/aeo13/index.cfm.

For PTACs, DOE used the same average lifetime of 10 years as used in the 2008 final rule for PTACs. 73 FR 58772, 58789 (Oct. 7, 2008). For SPVUs, DOE used an average of 15 years based on a review of a range of packaged cooling equipment lifetime estimates found in published studies and online documents. For further details on equipment lifetime, see the ASHRAE NODA TSD.

3. Compliance Date and Analysis Period

If DOE were to propose a rule prescribing energy conservation standards at the efficiency levels contained in ASHRAE Standard 90.1-2013, EPCA states that any such standard shall become effective on or after a date that is two or three years (depending on equipment type or size) after the effective date of the applicable minimum energy efficiency requirement in the amended ASHRAE standard (i.e., ASHRAE Standard 90.1-2013). (42 U.S.C. 6313(a)(6)(D)) All equipment for which analysis was performed in this NODA falls into the two-year category. For all PTACs and air-cooled equipment in this rulemaking, the effective date in ASHRAE Standard 90.1-2013 is January 1, 2015. Thus, if DOE decides to adopt the levels in ASHRAE Standard 90.1-2013, the rule would apply to PTACs and air-cooled equipment manufactured on or after January 1, 2017, which is two years from the effective date specified in ASHRAE Standard 90.1-2013. For all water-source heat pumps, SPVUs, and commercial water heaters in this rulemaking, ASHRAE Standard 90.1-2013 did not specify an effective date, so the publication date of October 9, 2013 is assumed. Thus, if DOE decides to adopt the levels in ASHRAE Standard 90.1-2013, the rule would apply to water-source heat pumps, SPVUs, and commercial water heaters manufactured on or after October 9, 2015, which is two years from the publication date of ASHRAE Standard 90.1-2013.

If DOE were to propose prescribing energy conservation standards higher than the efficiency levels contained in ASHRAE Standard 90.1-2013, under EPCA, any such standard will become effective for equipment manufactured four years after the date of publication of a final rule in the Federal Register. (42 U.S.C. 6313(a)(6)(D)) Thus, for equipment for which DOE might adopt a level more stringent than the ASHRAE efficiency level, the rule would apply to equipment manufactured on and after a date which is four years from the date of publication of the final rule adopting standards higher than the ASHRAE efficiency levels (with a requirement to complete that final rule no later than 30 months after publication of the revised ASHRAE Standard 90.1, which occurred on October 9, 2013). Under this timeline, compliance with such more stringent standards would be required no later than April 9, 2020.

For purposes of calculating the NES for water-source heat pumps, SPVUs, and commercial water heaters, DOE used an analysis period of 2015 (the assumed compliance date if DOE were to adopt the ASHRAE levels as Federal standards for this equipment) through 2044. For PTACs and air-cooled equipment, DOE used an analysis period of 2017 (the assumed compliance date if DOE were to adopt the ASHRAE levels as Federal standards for this equipment) through 2046. This is the standard analysis period of 30 years that DOE typically uses in its NES analysis. While the analysis periods remain the same for assessing the energy savings of Federal standard levels higher than the ASHRAE levels, those energy savings would not begin accumulating until 2020 (the assumed compliance date if DOE were to determine that standard levels more stringent than the ASHRAE levels are justified).

For each equipment class for which DOE developed a potential energy savings analysis, Table III.13 exhibits the approximate compliance dates of an amended energy conservation standard.

Table III.13 Approximate Compliance Date of an Amended Energy Conservation Standard for Each Equipment Class

Equipment Class	Approximate Compliance Date for Adopting the Efficiency Levels in ASHRAE Standard 90.1-2013	Approximate Compliance Date for Adopting More-Stringent Efficiency Levels than Those in ASHRAE Standard 90.1-2013
Three-Phase Air-Cooled Single Package Air Conditioners <65,000 Btu/h	01/2017	04/2020
Three-Phase Air-Cooled Single Package Heat Pumps <65,000 Btu/h	01/2017	04/2020
Three-Phase Air-Cooled Split System Heat Pumps <65,000 Btu/h	01/2017	04/2020
Water Source HP <17,000 Btu/h	10/2015	04/2020
Water Source HP ≥17,000 to <65,000 Btu/h	10/2015	04/2020
Water Source HP ≥65,000 to 135,000 Btu/h	10/2015	04/2020
PTAC <7,000 Btu/h	01/2017	04/2020
PTAC ≥7,000 to ≤15,000 Btu/h	01/2017	04/2020
PTAC >15,000 Btu/h	01/2017	04/2020
SPVAC <65,000 Btu/h,	10/2015	04/2020
SPVHP <65,000 Btu/h,	10/2015	04/2020
SPVAC ≥65,000 to <135,000 Btu/h	10/2015	04/2020
Oil-Fired Storage Water Heaters >105,000 Btu/h and <4,000 Btu/h/gal	10/2015	04/2020

E. Estimates of Potential Energy Savings

DOE estimated the potential primary energy savings in quads (i.e., 10^{15} Btu) for each efficiency level considered within each equipment class analyzed. The potential energy savings for efficiency levels more stringent than those specified by ASHRAE Standard 90.1-2013 were calculated relative to the efficiency levels that would result if ASHRAE Standard 90.1-2013 standards were adopted. Table III.14 through Table III.26 show the potential energy savings resulting from the analyses conducted as part of this NODA. The reported energy savings are cumulative over the period in which equipment shipped in the 30-year analysis continues to operate.

Table III.14 Potential Energy Savings for Small Three-Phase Air-Cooled Single-Package Air Conditioners <65,000 Btu/h

Efficiency Level	Primary Energy Savings Estimate* (Quads)	FFC Energy Savings Estimate* (Quads)
Level 1 – ASHRAE – 14 SEER	0.02	0.02
Level 2 – 15 SEER	0.04	0.04
Level 3 – 16 SEER	0.10	0.10
Level 4 – 17.5 SEER	0.12	0.12
Level 5 – "Max-Tech" – 19.15 SEER	0.14	0.15

* The potential energy savings for efficiency levels more stringent than those specified by ASHRAE Standard 90.1-2013 were calculated relative to the efficiency levels that would result if ASHRAE Standard 90.1-2013 standards were adopted.

Table III.15 Potential Energy Savings for Small Three-Phase Air-Cooled Single-Package Heat Pumps <65,000 Btu/h

Efficiency Level	Primary Energy Savings Estimate* (Quads)	FFC Energy Savings Estimate* (Quads)
Level 1 – ASHRAE – 14 SEER	0.001	0.001
Level 2 – 15 SEER	0.007	0.007
Level 3 – 16 SEER	0.014	0.014
Level 4 – "Max-Tech" – 18.05 SEER	0.018	0.019

* The potential energy savings for efficiency levels more stringent than those specified by ASHRAE Standard 90.1-2013 were calculated relative to the efficiency levels that would result if ASHRAE Standard 90.1-2013 standards were adopted.

Table III.16 Potential Energy Savings for Small Three-Phase Air-Cooled Split System Heat Pumps <65,000 Btu/h

Efficiency Level	Primary Energy Savings Estimate* (Quads)	FFC Energy Savings Estimate* (Quads)
Level 1 – ASHRAE – 14 SEER	0.002	0.002
Level 2 – 15 SEER	0.012	0.012
Level 3 – 16 SEER	0.026	0.026
Level 4 – "Max-Tech" – 18.05 SEER	0.033	0.033

* The potential energy savings for efficiency levels more stringent than those specified by ASHRAE Standard 90.1-2013 were calculated relative to the efficiency levels that would result if ASHRAE Standard 90.1-2013 standards were adopted.

Table III.17 Potential Energy Savings for Water-Source Heat Pumps <17,000 Btu/h

Efficiency Level	Primary Energy Savings Estimate* (Quads)	FFC Energy Savings Estimate* (Quads)
Level 1 – ASHRAE – 12.2 EER	0.001	0.001
Level 2 – 13 EER	0.007	0.007
Level 3 – 14 EER	0.025	0.026
Level 4 – 15.7 EER	0.063	0.064
Level 5 – 16.5 EER	0.082	0.083
Level 6 – "Max-Tech" – 18.1 EER	0.116	0.118

* The potential energy savings for efficiency levels more stringent than those specified by ASHRAE Standard 90.1-2013 were calculated relative to the efficiency levels that would result if ASHRAE Standard 90.1-2013 standards were adopted.

Table III.18 Potential Energy Savings for Water-Source Heat Pumps ≥17,000 and <65,000 Btu/h

Efficiency Level	Primary Energy Savings Estimate* (Quads)	FFC Energy Savings Estimate* (Quads)
Level 1 – ASHRAE – 13 EER	0.001	0.001
Level 2 – 14.6 EER	0.064	0.065
Level 3 – 16.6 EER	0.280	0.284
Level 4 – 18 EER	0.451	0.459
Level 5 – 19.2 EER	0.591	0.601
Level 6 – "Max-Tech" – 21.6 EER	0.831	0.844

* The potential energy savings for efficiency levels more stringent than those specified by ASHRAE Standard 90.1-2013 were calculated relative to the efficiency levels that would result if ASHRAE Standard 90.1-2013 standards were adopted.

Table III.19 Potential Energy Savings for Water-Source Heat Pumps ≥65,000 and <135,000 Btu/h

Efficiency Level	Primary Energy Savings Estimate* (Quads)	FFC Energy Savings Estimate* (Quads)
Level 1 – ASHRAE – 13 EER	-**	-**
Level 2 – 14 EER	0.004	0.004
Level 3 – 15 EER	0.013	0.014
Level 4 – 16 EER	0.032	0.033
Level 5 – "Max-Tech" – 17.2 EER	0.057	0.058

* The potential energy savings for efficiency levels more stringent than those specified by ASHRAE Standard 90.1-2013 were calculated relative to the efficiency levels that would result if ASHRAE Standard 90.1-2013 standards were adopted.
**There are no potential savings for this Level because all models currently on the market exceed this efficiency level, and thus would not be affected by a standard set at this level.

Table III.20 Potential Energy Savings for PTAC <7,000 Btu/h

Efficiency Level	Primary Energy Savings Estimate* (Quads)	FFC Energy Savings Estimate* (Quads)
Level 1 – ASHRAE – 11.9 EER	-**	-**
Level 2 – 12.2 EER	-**	-**
Level 3 – 12.6 EER	0.001	0.001
Level 4 – 13.1 EER	0.002	0.002
Level 5 – 13.6 EER	0.003	0.003
Level 6 – "Max-Tech" – 14.0 EER	0.004	0.004

* The potential energy savings for efficiency levels more stringent than those specified by ASHRAE Standard 90.1-2013 were calculated relative to the efficiency levels that would result if ASHRAE Standard 90.1-2013 standards were adopted.
**There are no potential savings for this Level because all models currently on the market exceed this efficiency level, and thus would not be affected by a standard set at this level.

Table III.21 Potential Energy Savings for PTAC ≥7,000 and ≤15,000 Btu/h

Efficiency Level	Primary Energy Savings Estimate* (Quads)	FFC Energy Savings Estimate* (Quads)
Level 1 – ASHRAE – 11.3 EER	0.001	0.001
Level 2 – 11.5 EER	0.005	0.005
Level 3 – 12.0 EER	0.022	0.023
Level 4 – 12.4 EER	0.040	0.040
Level 5 – 12.9 EER	0.058	0.058
Level 6 – "Max-Tech" – 13.3 EER	0.076	0.077

* The potential energy savings for efficiency levels more stringent than those specified by ASHRAE Standard 90.1-2013 were calculated relative to the efficiency levels that would result if ASHRAE Standard 90.1-2013 standards were adopted.

Table III.22 Potential Energy Savings for PTAC >15,000 Btu/h

Efficiency Level	Primary Energy Savings Estimate* (Quads)	FFC Energy Savings Estimate* (Quads)
Level 1 – ASHRAE – 9.5 EER	0.0009	0.0009
Level 2 – 9.7 EER	0.0007	0.0007
Level 3 – 10.0 EER	0.0022	0.0023
Level 4 – 10.4 EER	0.0037	0.0038
Level 5 – 10.8 EER	0.0053	0.0053
Level 6 – “Max-Tech” – 11.2 EER	0.0068	0.0069

* The potential energy savings for efficiency levels more stringent than those specified by ASHRAE Standard 90.1-2013 were calculated relative to the efficiency levels that would result if ASHRAE Standard 90.1-2013 standards were adopted.

Table III.23 Potential Energy Savings Estimates for SPVAC <65,000 Btu/h

Efficiency Level	Primary Energy Savings Estimate* (Quads)	FFC Energy Savings Estimate* (Quads)
Level 1 – ASHRAE - 10 EER	0.21	0.21
Level 2 – 10.5 EER	0.07	0.07
Level 3 – 11 EER	0.14	0.14
Level 4 – 11.8 EER	0.22	0.23
Level 4 – “Max-Tech” – 12.3 EER	0.28	0.29

* The potential energy savings for efficiency levels more stringent than those specified by ASHRAE Standard 90.1-2013 were calculated relative to the efficiency levels that would result if ASHRAE Standard 90.1-2013 standards were adopted.

Table III.24 Potential Energy Savings Estimates for SPVHP<65,000 Btu/h

Efficiency Level	Primary Energy Savings Estimate*,** (Quads)	FFC Energy Savings Estimate*,** (Quads)
Level 1 – ASHRAE - 10 EER	0.06	0.06
Level 2 – 10.5 EER	0.05	0.05
Level 3 – 11 EER	0.08	0.08
Level 4 – 11.8 EER	0.17	0.18
Level 4 – “Max-Tech” – 12.3 EER	0.19	0.19

* The potential energy savings for efficiency levels more stringent than those specified by ASHRAE Standard 90.1-2013 were calculated relative to the efficiency levels that would result if ASHRAE Standard 90.1-2013 standards were adopted.
** For SPVHPs, the energy savings estimates are based on both cooling savings (EER) and heating savings (COP).

Table III.25 Potential Energy Savings Estimates for SPVAC ≥65,000 and <135,000 Btu/h

Efficiency Level	Primary Energy Savings Estimate (Quads)	FFC Energy Savings Estimate (Quads)
Level 1 – ASHRAE – 10.0 EER	0.02	0.02

Table III.26 Potential Energy Savings Estimates for Commercial Oil-Fired Storage Water Heaters >105,000 Btu/h and <4,000 Btu/h/gal

Efficiency Level	Primary Energy Savings Estimate* (Quads)	FFC Energy Savings Estimate* (Quads)
Level 1 – ASHRAE – 80% E_t	0.002	0.002
Level 2 – 81% E_t	0.001	0.001
Level 3 – "Max-Tech" – 82% E_t	0.002	0.002

* The potential energy savings for efficiency levels more stringent than those specified by ASHRAE Standard 90.1-2013 were calculated relative to the efficiency levels that would result if ASHRAE Standard 90.1-2013 standards were adopted.

IV. Public Participation

A. Submission of Comments

DOE will accept comments, data, and information regarding this NODA no later than the date provided in the **DATES** section at the beginning of this notice. Interested parties may submit comments, data, and other information using any of the methods described in the **ADDRESSES** section at the beginning of this notice.

Submitting comments via www.regulations.gov. The www.regulations.gov web page will require you to provide your name and contact information. Your contact information will be viewable to DOE Building Technologies staff only. Your contact information will not be publicly viewable except for your first and last names, organization name (if any), and submitter representative name (if any). If your comment is not processed properly because of technical difficulties, DOE will use this information to contact you. If DOE cannot read your comment due to technical difficulties and cannot contact you for clarification, DOE may not be able to consider your comment.

However, your contact information will be publicly viewable if you include it in the comment itself or in any documents attached to your comment. Any information that you do not want to be publicly viewable should not be included in your comment, nor in any document attached to your comment. Otherwise, persons viewing comments will see only first and last names, organization names, correspondence containing comments, and any documents submitted with the comments.

Do not submit to www.regulations.gov information for which disclosure is restricted by statute, such as trade secrets and commercial or financial information (hereinafter referred to as Confidential Business Information (CBI)). Comments submitted through www.regulations.gov cannot be claimed as CBI. Comments received through the website will waive any CBI claims for the information submitted. For information on submitting CBI, see the Confidential Business Information section below.

DOE processes submissions made through www.regulations.gov before posting. Normally, comments will be posted within a few days of being submitted. However, if large volumes of comments are being processed simultaneously, your comment may not be viewable for up to several weeks. Please keep the comment tracking number that www.regulations.gov provides after you have successfully uploaded your comment.

Submitting comments via email, hand delivery/courier, or mail. Comments and documents submitted via email, hand delivery, or mail also will be posted to www.regulations.gov. If you do not want your personal contact information to be publicly viewable, do not include it in your comment or any accompanying documents. Instead, provide your contact information in a cover letter. Include your first and last names, email address, telephone number, and optional mailing address. The cover letter will not be publicly viewable as long as it does not include any comments.

Include contact information each time you submit comments, data, documents, and other information to DOE. Email submissions are preferred. If you submit via mail or hand delivery/courier, please provide all items on a CD, if feasible, in which case, it is not necessary to submit printed copies. No telefacsimiles (faxes) will be accepted.

Comments, data, and other information submitted to DOE electronically should be provided in PDF (preferred), Microsoft Word or Excel, WordPerfect, or text (ASCII) file format. Provide documents that are not secured, that are written in English, and that are free of any defects or viruses. Documents should not contain special characters or any form of encryption and, if possible, they should carry the electronic signature of the author.

<u>Campaign form letters</u>. Please submit campaign form letters by the originating organization in batches of between 50 to 500 form letters per PDF or as one form letter with a list of supporters' names compiled into one or more PDFs. This reduces comment processing and posting time.

<u>Confidential business information</u>. Pursuant to 10 CFR 1004.11, any person submitting information that he or she believes to be confidential and exempt by law from public disclosure

should submit via email, postal mail, or hand delivery/courier two well-marked copies: one copy of the document marked "confidential" that includes all the information believed to be confidential, and one copy of the document marked "non-confidential" with the information believed to be confidential deleted. Submit these documents via email or on a CD, if feasible. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

Factors of interest to DOE when evaluating requests to treat submitted information as confidential include: (1) a description of the items; (2) whether and why such items are customarily treated as confidential within the industry; (3) whether the information is generally known by or available from other sources; (4) whether the information has previously been made available to others without obligation concerning its confidentiality; (5) an explanation of the competitive injury to the submitting person which would result from public disclosure; (6) when such information might lose its confidential character due to the passage of time; and (7) why disclosure of the information would be contrary to the public interest.

It is DOE's policy that all comments may be included in the public docket, without change and as received, including any personal information provided in the comments (except information deemed to be exempt from public disclosure).

B. Issues on Which DOE Seeks Comment

Although DOE welcomes comments on any aspect of this notice, DOE is particularly interested in receiving comments and views of interested parties concerning the following issues:

(1) DOE's proposal to re-create separate equipment classes for single-package and split system equipment in the overall equipment classes of small commercial package air conditioning and heating equipment (air-cooled, three-phase) less than 65,000 Btu/h;

(2) The nomenclature changes in ASHRAE 90.1-2013 from "water source" to "water to air, water loop" and from "COP" to "COP_H", and whether in fact they are editorial in nature;

(3) The proposed definition for "water-source heat pump;"

(4) DOE's tentative proposal to not establish a separate space-constrained class for SPVUs;

(5) DOE's preliminary conclusion that the updates to the most recent versions of ANSI Z21.47 do not have a substantive impact on the measurement of energy efficiency for gas-fired furnaces;

(6) Whether energy usage for three-phase commercial air-cooled equipment would be similar to that modeled for single-phase equipment in commercial buildings;

(7) Whether increasing the HSPF for commercial air-cooled equipment less than 65,000 Btu/h will result in significant energy savings, and, if so, data to support such conclusion;

(8) The appropriateness of using the cooling UECs for water-source heat pumps developed in the 2000 screening analysis, or other sources of data for this analysis;

(9) Data and information related to water-source heat pump heating energy use;

(10) DOE's analysis of UEC for SPVUs and its use in establishing the energy savings potential for more-stringent standards. Of particular interest to DOE is input on shipments of SPVHP equipment to telecommunications shelters and the frequency of use of economizers in equipment serving these shelters;

(11) Input on how or if regional differences between the shipments of heat pumps and air conditioners to warmer or cooler climates can be taken into account in the SPVU energy use characterization;

(12) DOE's derivation of UECs for oil-fired storage water heaters;

(13) Data and information related to the current shipments of water-source heat pumps and expected future trends;

(14) The share of the market for ground-source and ground-water-source heat pump applications that use models also rated for water-loop application;

(15) DOE's shipment methodologies and projections for all equipment analyzed in today's NODA, and any shipments data related to these equipment; and

(16) DOE's determination of the base-case distribution efficiencies and its prediction on how amended energy conservation standards would affect the distribution of efficiencies in the standards case for the thirteen classes of equipment for which analysis was performed.

V. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of this notice of data availability.

Issued in Washington, DC, on April 7, 2014.

Kathleen B. Hogan
Deputy Assistant Secretary for Energy Efficiency
Energy Efficiency and Renewable Energy

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